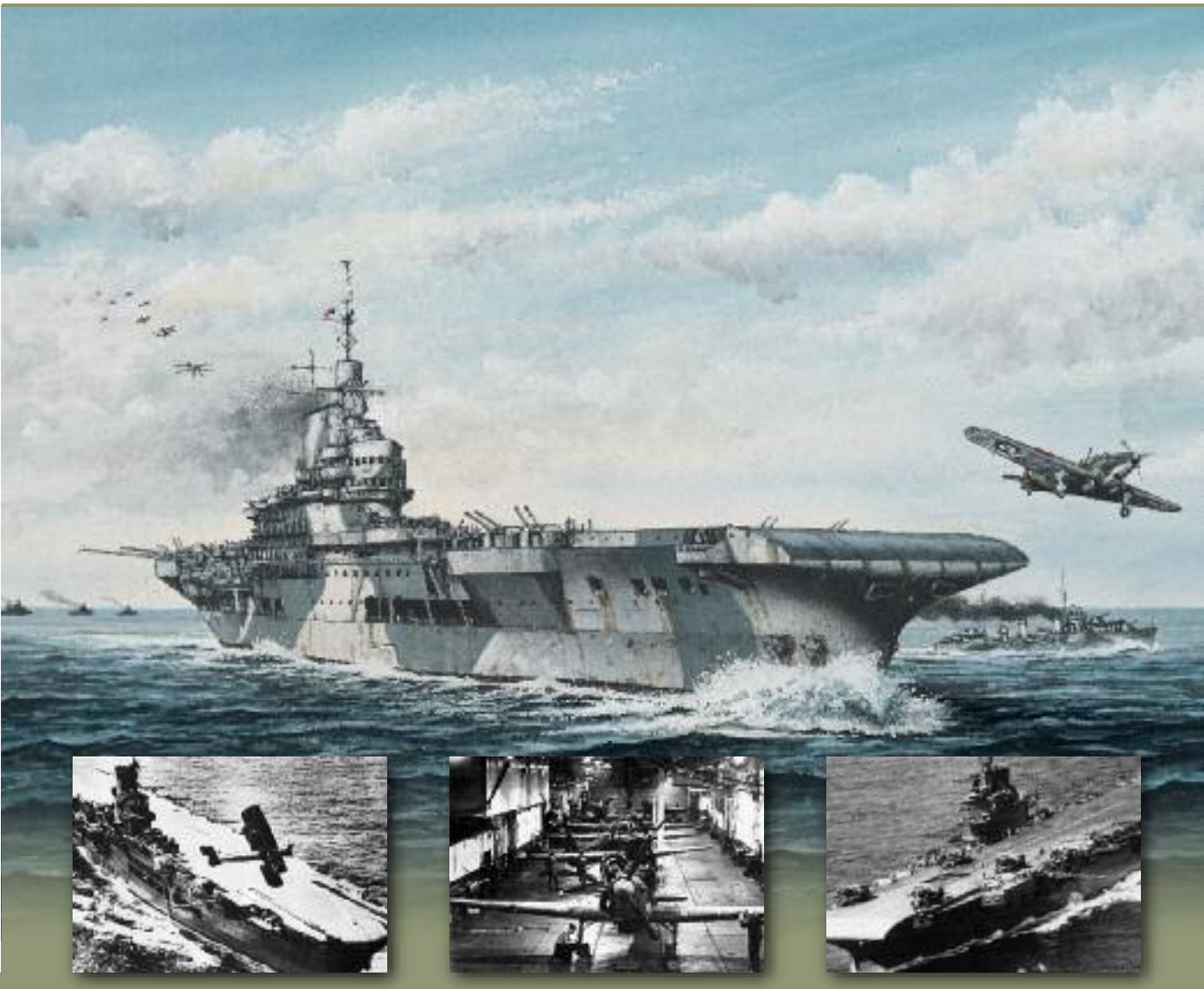
BRITISH AIRCRAFT CARRIERS 1939–45



ANGUS KONSTAM

ILLUSTRATED BY TONY BRYAN

NEW VANGUARD • 168

BRITISH AIRCRAFT CARRIERS 1939–45

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First published in Great Britain in 2010 by Osprey Publishing,
Midland House, West Way, Botley, Oxford, OX2 0PH, UK
44–02 23rd St, Suite 219, Long Island City, NY 11101, USA
E-mail: info@ospreypublishing.com

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A CIP catalogue record for this book is available from the British Library

Print ISBN: 978 1 84908 079 8
PDF e-book ISBN: 978 1 84908 080 4

Page layout by: Melissa Orrom Swan, Oxford
Index by Alan Thatcher
Typeset in Sabon and Myriad Pro
Originated by United Graphic Pte Ltd
Printed in China through Worldprint Ltd

10 11 12 13 14 10 9 8 7 6 5 4 3 2 1

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BRITISH AIRCRAFT CARRIERS 1939–45

INTRODUCTION

At the start of the 20th century the Royal Navy was the most powerful naval force in the world. It was in Great Britain's interests to maintain the naval *status quo*, but to achieve this the Lords of the Admiralty had to be innovative rather than conservative. This was a time of great technological advance, and the launch of the battleship HMS *Dreadnought* (1906) demonstrated this desire to embrace the latest developments, even if this rendered much of the existing battlefleet obsolete.

HMS *Victorious*, one of the Illustrious Class of British fleet carriers – the vessels that formed the backbone of the Royal Navy's carrier force during the Second World War. She first saw action during the pursuit of the German battleship *Bismarck*.

At the same time as dreadnought battleships were being built, the Royal Navy was also experimenting with both submarines and aircraft. Airships were commissioned, but these never proved particularly practical, despite the enthusiasm of Germany's Count Zeppelin for lighter-than-air dirigibles. Aeroplanes offered greater potential, and during the First World War (1914–18) British naval aviators pioneered the launch and recovery of aircraft from the decks of warships.

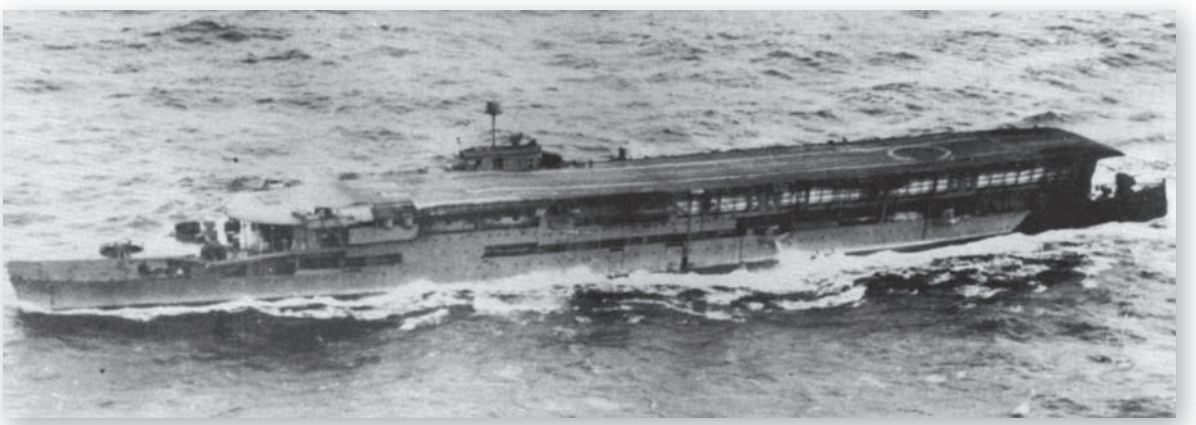
The first naval aircraft were seaplanes or aircraft which could be launched but not recovered. By the end of the First World War aircraft were landing on rudimentary flight decks and the first generation of fully-fledged aircraft carriers began to enter service. During the interwar years this carrier force was expanded and the vessels converted to carry larger and more powerful aircraft, including ones armed with torpedoes. Then, during the last years of peace in the 1930s, a new generation of British aircraft carriers began to appear – vessels which had been purpose-built for the job. These were fundamentally different from the vessels produced for the US and Japanese fleets. They carried fewer aircraft, but they were armoured – a feature which would prove its worth in action.

During the Second World War, despite the loss of four of their number these British 'fleet carriers' saw service in every theatre, and participated in some of the most dramatic naval engagements of the war, including the raid on Taranto, the sinking of the *Bismarck*, the naval battle for Malta, and the fighting in the Pacific, where British carriers operating alongside their US counterparts were able to shrug off damage that would have crippled the latter. This is the story of these rugged British carriers, and the airmen and aircraft of the Fleet Air Arm who provided them with their offensive capability.

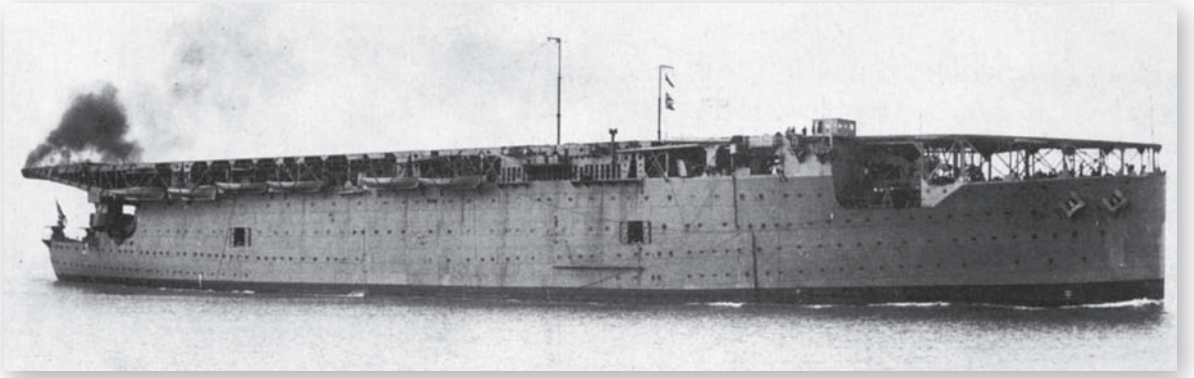
THE DEVELOPMENT OF BRITAIN'S CARRIER FLEET

The Carriers of the Great War

It could be argued that the story of Britain's aircraft carriers began on a summer's day in Orkney, in 1917, when the first-ever deck landing on a moving warship was attempted. Earlier that year, when the battlecruiser HMS *Furious* had been nearing completion the order was given to convert it into a hybrid aircraft carrier. A long, gently-sloping flying-off deck was fitted forward of the bridge in place of the front gun-turret. This ungainly-looking warship entered service in late June 1917, and just five weeks later would make aviation history.



A former battlecruiser, HMS *Furious* went through various metamorphoses during her long service career, but by 1939 she was a fully-fledged aircraft carrier boasting a small newly-fitted island, having been completely flush-decked during the 1930s. The vessel was finally scrapped in 1948.



HMS *Argus* was the first real carrier to enter service with the Royal Navy, having been converted from a liner during the First World War. By 1939 she was being used as a training carrier; later she served as a convoy escort.

Until then aircraft had taken off from flying-off decks, but then either landed on shore or crash-landed in the sea. However, on 2 August 1917, Sqn Cdr Edwin Dunning of the Royal Naval Air Service attempted a deck landing. The experiment took place in Scapa Flow – Britain's great wartime anchorage in Orkney, off the north coast of the Scottish mainland. Sqn Cdr Dunning manoeuvred his Sopwith Pup around the superstructure of *Furious* and landed his frail little fighter on the flying-off deck, where eager hands rushed to hold the aircraft down. However, when the pilot tried to repeat the landing, a tyre burst; he lost control and the aircraft went over the ship's side, killing Sqn Cdr Dunning as it hit the water.

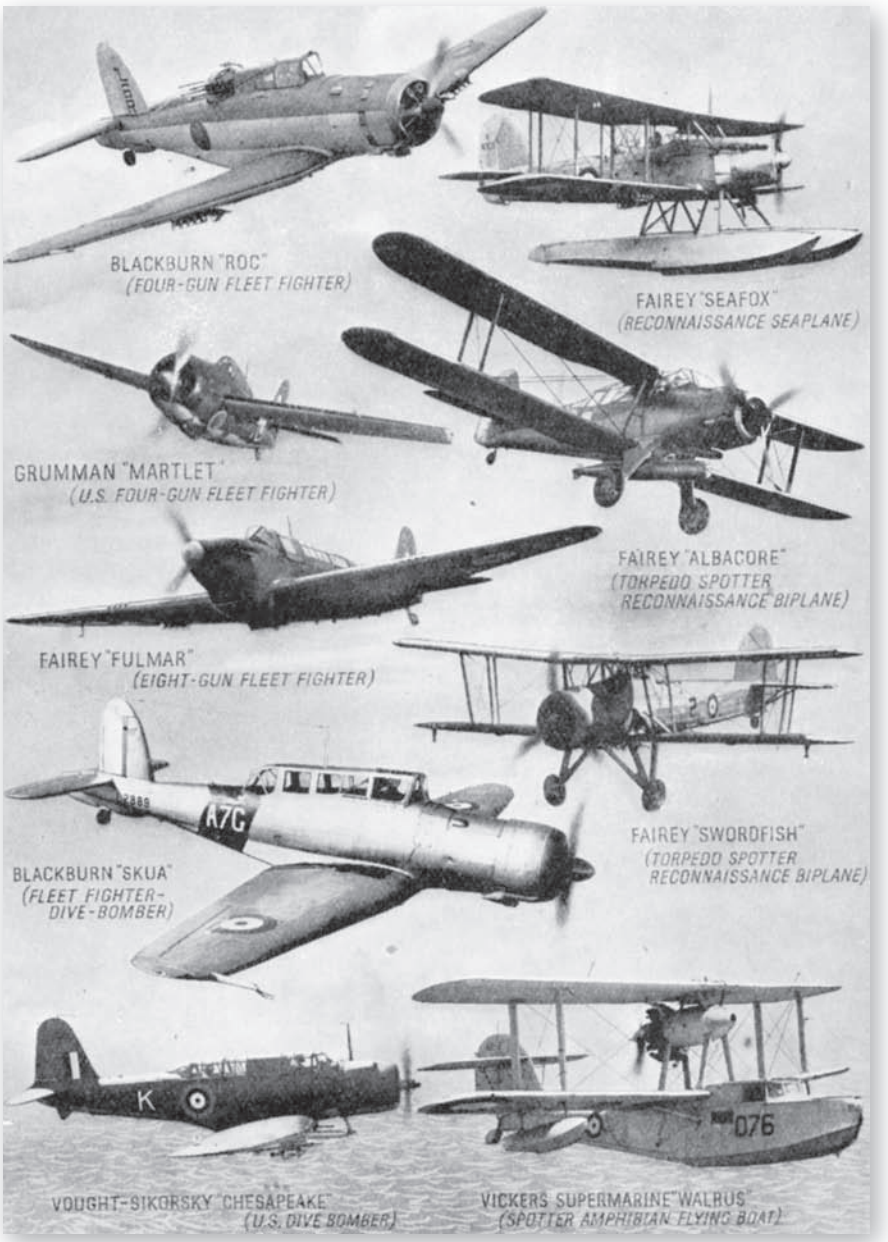
Despite this setback it was clear that naval aviation had a future. A few weeks before Sqn Cdr Dunning's flight the Admiralty had already taken the ambitious step of ordering the construction of HMS *Hermes*, the first British warship to be designed as an aircraft carrier from the keel up. The final design was revised in light of the *Furious* experiments, which meant construction was delayed. The problem in the case of these experiments was with the ship, not the idea. *Furious* returned to the shipyard to have a flying-on deck mounted in place of the stern gun-turret, although the bridge and funnel still lay between the flying-on and flying-off decks. While the conversion was under way, the Admiralty looked around for other warships to convert into aircraft carriers. The navy already had several seaplane carriers or vessels fitted with flying-off platforms. HMS *Ben-my-Chree*, HMS *Vindex*, HMS *Campania* and HMS *Manxman* all had flying-off platforms, but were too small to be converted into proper aircraft carriers. The navy needed larger and more commodious vessels.

Meanwhile, *Hermes* was finally laid down at the Armstrong-Whitworth shipyard on Tyneside in January 1918, but the war ended long before the carrier was launched, let alone commissioned. *Hermes* finally entered service in 1923, becoming Britain's only purpose-built aircraft carrier for 15 years. *Hermes* was a strange vessel. In effect she was built on the lines of a light cruiser, and it was envisaged that the ship would accompany scouting squadrons – it was almost as if the Admiralty were hoping any future war at sea would be a re-run of the Battle of Jutland (1916). The result was a fast carrier which was too small to launch a powerful airstrike against an enemy fleet.

Luckily, the Admiralty had other vessels earmarked for use as carriers. In the summer of 1917 HMS *Argus* was already under construction, having been laid down as a merchant ship, then converted into a seaplane carrier and finally an aircraft carrier while still on the stocks at the Beardmore shipyard on the River Clyde. Before Sqn Cdr Dunning's flight, it was envisaged that *Argus* would have flying-off and flying-on platforms, separated by the superstructure. However,

the vessel was completed with a 350ft full-length flight deck unobstructed by any superstructure. *Argus* was designed to carry Sopwith Cuckoo torpedo-bombers and Sopwith Camel fighters, and entered service in September 1918.

A much less suitable design was HMS *Vindictive*, which entered service in October 1918. She was laid down as a Hawkins Class light cruiser, but completed as a hybrid carrier. *Vindictive* still looked like a cruiser, but had a small flying-off deck fitted in front of the bridge and twin funnels, and a larger landing-on deck aft. The ship proved highly unsatisfactory. The landing-on deck was removed in the 1920s, and *Vindictive* became a hybrid seaplane carrier, then a training vessel. In all honesty, the ship was such a mess that the navy never really found a use for it. During the Second World War *Vindictive* was used as a repair ship, then was broken up in 1946.



Throughout the war the effectiveness of the Fleet Air Arm was limited due to being equipped with obsolete or otherwise inadequate aircraft. Of those pictured here the Fairey Swordfish and Fairey Albacore were torpedo-bombers, the Blackburn Skua and Fairey Fulmar were fighter-bombers, and the Blackburn Roc and Grumman Martlet were fighters.

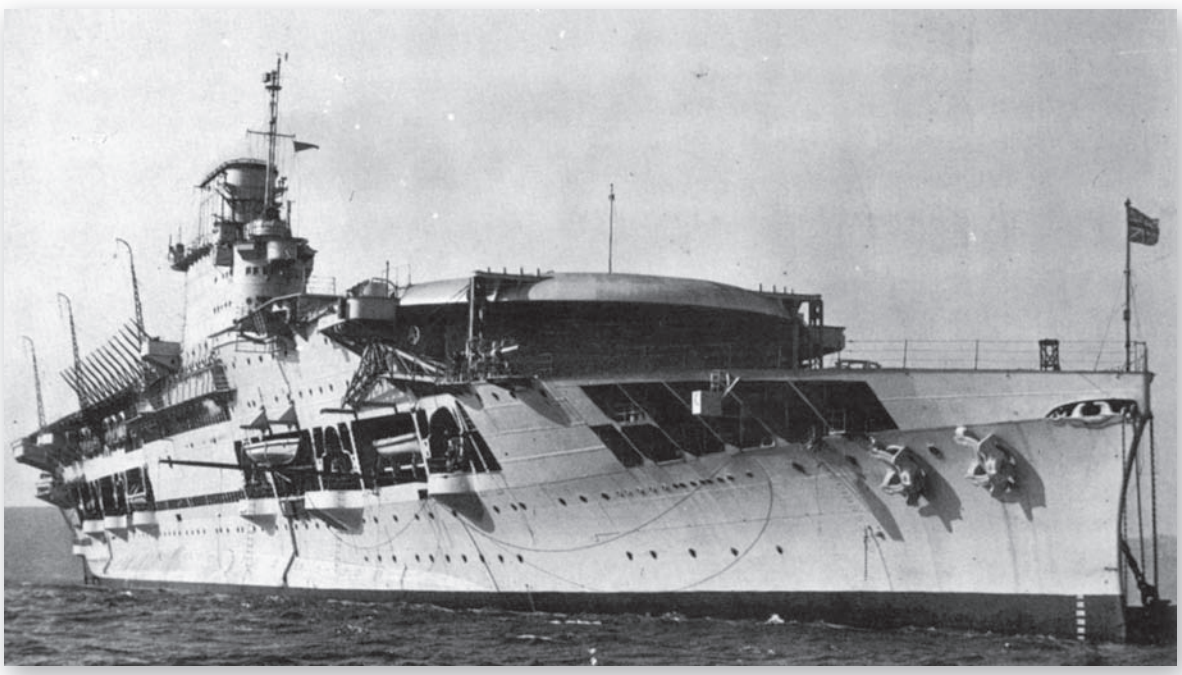
March 1918 saw *Furious* return from her second conversion, but the superstructure still proved a problem as the wind turbulence created still made landing a hazardous business. *Furious* was therefore still used as a 'one-shot weapon' – launching her aircraft without any real hope of recovering them again. Still, the warship proved her worth. In June two of her Sopwith Camels shot down a shadowing Zeppelin, and two months later her aircraft bombed the Zeppelin sheds at Tondern in Belgium. The Grand Fleet now had fighter cover and a new striking force.

At the war's end in November 1918 the Royal Navy had three aircraft carriers in service – *Furious*, *Argus* and *Vindictive* – but of these only *Argus* with her unobstructed flight deck allowed almost risk-free landings. The whole question of flight-deck design had taxed naval designers and experiments continued. An experimental island was fitted to *Argus*, and the final designs of *Hermes* and *Eagle* were changed several times while these ships were still being built. These and other experiments demonstrated conclusively that the hybrid carrier was a non-starter.

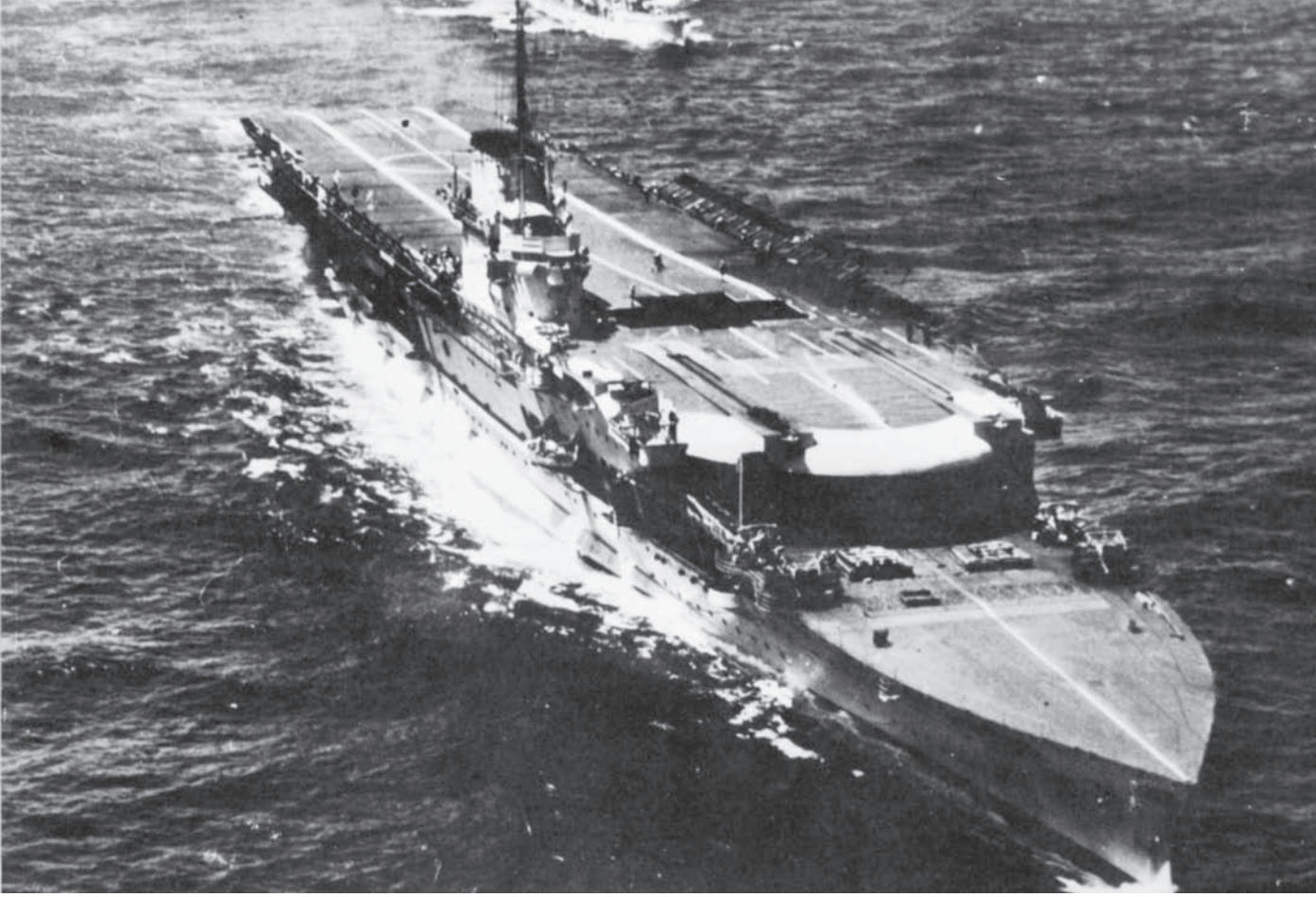
It was from this point on that the classic design of the aircraft carrier began to emerge – with a single flight deck extending the length of the vessel, and either no superstructure at all or a small island located amidships on the starboard side. Experiments with island superstructures showed that for ship-handling purposes the starboard-amidships location was the best – the bridge crew could control the ship when coming into harbour or docking, yet this location also provided the least possible disruption to airflow over the flight deck itself.

Interwar Developments

The 1920s proved a lean time for the Royal Navy. Postwar budget cuts meant that much of the fleet had to be scrapped and there was little funding available for new construction. In effect the navy had to make do with what it had. The naval treaties of the interwar years had much to do with this, as did the



Like her sister-ship *Glorious*, HMS *Courageous* began life as a First World War battlecruiser but was converted into an aircraft carrier in the 1920s. *Courageous* was sunk by a German U-boat two weeks after the outbreak of war.



HMS *Glorious* could be distinguished from her sister-ship *Courageous* by her slightly longer flight deck and plain pole mast. She served with the Home Fleet until being caught and sunk by two German battlecruisers off Norway in June 1940.

'Ten Year Rule', whereby each year British policymakers asked whether Britain and its Empire would be called upon to fight a major war within the coming decade. As the answer was usually negative, politicians felt justified in denying funds to the Royal Navy and Fleet Air Arm.

The Washington Naval Treaty, signed in 1922, was designed to allow the major naval powers to scale back spending and avoid a repeat of the naval arms race that preceded the First World War. A limit was placed on the number of capital ships in each fleet, and the displacement of new warships was capped at 35,000 tons (imperial). The treaty specifically addressed the carrier fleets planned by the leading navies. A total of 135,000 tons was allocated for the British and US navies, while the Japanese carrier fleet was limited to a total of 81,000 tons. France and Italy were allowed 60,000 tons apiece. No more than two carriers in any fleet could have a displacement greater than 27,000 tons, and their total displacement was capped at 32,000 tons – a few thousand tons less than battleships. Consequently, the United States and Japan began converting battlecruisers into aircraft carriers – resulting in the USS *Lexington* and IJNS *Akagi*. The whole idea behind the battlecruiser – the sacrifice of armour in favour of speed – had been exposed as a fallacy during the Battle of Jutland, when battlecruisers were used as battleships and not surprisingly fell short of expectations. The Royal Navy baulked at the idea of converting the powerful new battlecruisers *Repulse*, *Renown* and *Hood*, and most of the rest of the old battlecruiser fleet was being scrapped in accordance with the new treaty limits. That left two smaller battlecruisers of the Courageous Class, so plans were drawn up to convert these into fleet carriers.

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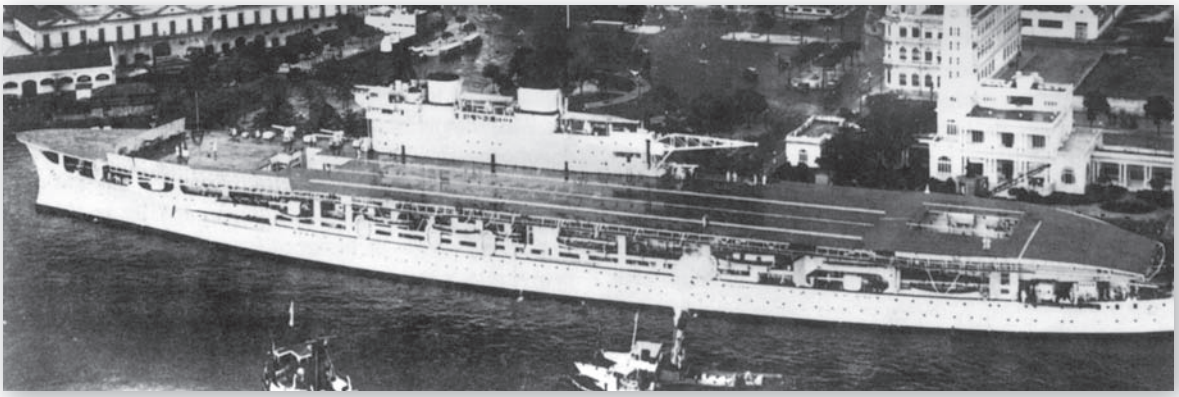
BRITISH AIRCRAFT CARRIERS 1939–45

ANGUS KONSTAM ILLUSTRATED BY TONY BRYAN



The slab-sided HMS *Eagle* began life as a dreadnought intended for the Chilean Navy before the First World War, but entered service with the Royal Navy as an aircraft carrier in 1924.. She served as a stalwart of the Mediterranean Fleet until sunk by U-73 in August 1942.

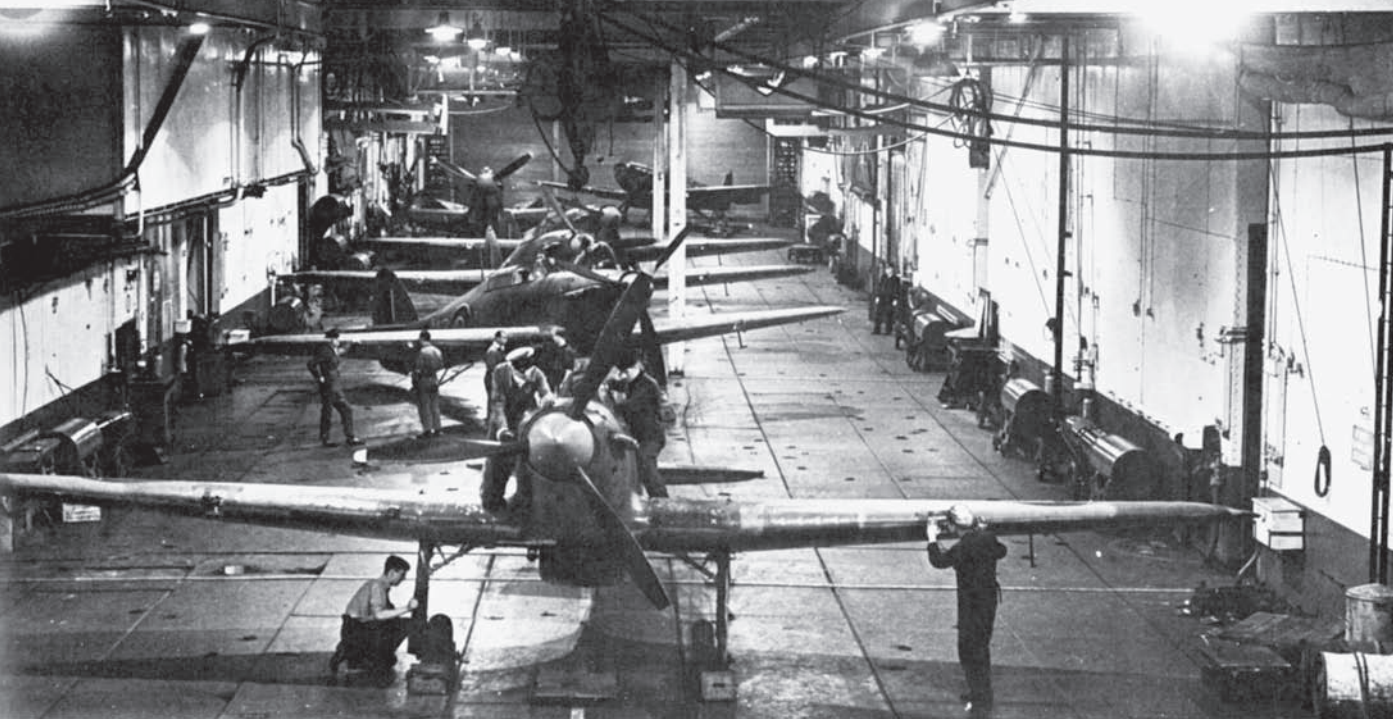
By early 1924 the Royal Navy had three operational carriers – *Argus*, *Hermes* and *Eagle*. Together these accounted for just under 50,000 tons of the allotted 135,000 tons. If *Furious* was converted into a fully flush-decked aircraft carrier, and the Courageous Class battlecruisers *Courageous* and *Glorious* were also converted, the total would increase to 115,000 tons by around 1930. At that point the three smaller carriers could be scrapped, and around 1934 they could be replaced by two large 32,000-ton carriers or four new 17,000-ton ones. *Vindictive* would be reconverted into a cruiser and the old seaplane carriers quietly decommissioned.

The idea behind having four light carriers was commerce protection. Although the Royal Navy was being starved of funding it still had global commitments, and having the four carriers would allow some form of air cover to protect merchant shipping on exposed trade routes and in far-flung corners of the Empire. Although this theory was soon abandoned, the argument for light carriers would re-emerge during the Second World War, by which time the need for convoy carrier escorts had become a pressing one. A combination of parsimony, abandonment of treaty obligations and plain common-sense also led to the navy retaining the three small carriers it already had.

One positive outcome of the treaty for the Royal Navy was approval to transform *Furious*, *Courageous* and *Glorious* into fully operational fleet carriers. It had already been decided that *Furious* needed to be rebuilt. In 1921 the Director of Naval Construction, Sir Eustace Tennyson d'Eyncourt, had proposed stripping *Furious* down to her main deck, building a two-storey hangar on top of this, and fitting a flush deck. Engine exhaust would be vented via the sides or stern rather than vertical funnels. All these procedures were followed.

In 1922 *Furious* was taken to Rosyth Dockyard in Fife, Scotland, to be stripped down, then to Devonport Royal Dockyard to be built up again. The new-look *Furious* boasted a flight deck which extended for 575 feet – almost three-quarters of the ship's full length. The rest of the deck space was taken up with a large forecastle and quarterdeck, with a curious small flying-off platform for seaplanes located on the forecastle immediately under the front of the flight deck. There was no superstructure, just a small navigating position on the starboard side at the front of the flight deck, with a flying control position on the port side.

This was certainly an innovative design, largely inspired by the success of HMS *Argus* as a flush-deck carrier. The difference was that *Argus* was designed to operate 30 small aircraft or 20 larger, more modern aircraft, while *Furious* could carry 36 of the latest fighters and torpedo-bombers. *Furious* was



This view of the inside of the hangar of HMS *Argus* demonstrates the main problem when employing land-based aircraft for naval use: these Hurricanes were effective fighters, but their fixed wings took up an inordinate amount of hangar space compared with folding-wing aircraft.

re-commissioned in September 1925, and the design proved a great success. The vessel underwent further modifications during the 1930s. First the quarterdeck was raised to improve seakeeping, and additional anti-aircraft guns were fitted on the forecastle after the small flying-off platform was removed. Then, just before the outbreak of the Second World War *Furious* underwent another major refit. The remaining secondary 5.5in guns were replaced with more useful twin 4in dual-purpose weapons, along with modern fire-control directors. Lighter anti-aircraft protection was provided by three eight-barrelled 2pdr 'pom-poms'. New arrester gear was fitted to the flight deck, and a small island was added amidships on the starboard side. During the war the defensive armament was augmented by another multiple pom-pom and a steadily increasing number of 20mm Oerlikons – a total of 22 of the latter being fitted by the end of the war. *Furious* was also equipped with gunnery-direction and air-search radar. However, the fact that aircraft were now larger meant that capacity dropped to just 30 aeroplanes.

A similar design was adopted for *Courageous* and *Glorious*. These two Courageous Class light battlecruisers were completed in 1917, but regarded with suspicion by the navy partly because they were too light and poorly armed to serve alongside other capital ships in the fleet. Like *Furious* they had been designed for service in the coastal waters of the Baltic, but they were never used in that role. After the Washington Treaty was signed most observers expected them to be scrapped, but instead they were earmarked as aircraft carriers, modelled on the new *Furious*. Work began in 1923, with everything above the main deck on both ships removed and two hangars being added. The top hangar led out onto a flying-off deck in the bow – an enlarged version of the flying-off platform fitted to *Furious*.

As was the case with *Furious*, the flight deck did not run the whole length of the ship. A small quarterdeck was needed at the stern, so the flight deck was made 550ft long, so as to run for about three-quarters the length of the hull and leave space for a large forecastle situated below it, on the level of the main deck. The leading edge of the flight deck was rounded to reduce wind turbulence, and it overlooked the forecastle flying-off deck below it. This

flight deck was pierced by two lifts and sloped upwards at the bow end to assist take-offs. One major modification to the *Furious* design was made as reconstruction work was under way: an island was added amidships on the starboard side, and her streamlined proportions became the model for later British carriers. It had been decided that such a configuration provided for the best possible control of both the ship and of flying operations, without having a major impact on wind turbulence over the flight deck.

Like *Furious*, *Glorious* was cut down in Rosyth and rebuilt in Devonport, where Courageous was already undergoing conversion. *Courageous* was re-commissioned in the early summer of 1928, and *Glorious* followed her into service in the spring of 1930. Both new carriers proved ideal. They were fast, and while their capacity of 48 aircraft apiece was small compared with the latest US or Japanese carriers, they permitted the carrying of a fair-sized air group of fighters, torpedo-bombers and reconnaissance aircraft.

Over the next decade both carriers underwent slight modifications. Arrester gear was added – a necessity given the newer, heavier aircraft then being introduced – and the anti-aircraft armament was augmented somewhat. As built, the carriers were protected by a battery of sixteen 4.7in AA guns – six on each hull side plus two each on forecastle and quarterdeck. Four single 2pdr pom-poms were also added, but this did little to improve anti-aircraft capabilities. More importantly, the square end of the flight deck caused turbulence problems when landing. In 1934, in a bid to address this, an extension was fitted to *Glorious* which sloped downwards and covered the quarterdeck below it. However, although the same modification was planned for *Courageous* this was never carried out.

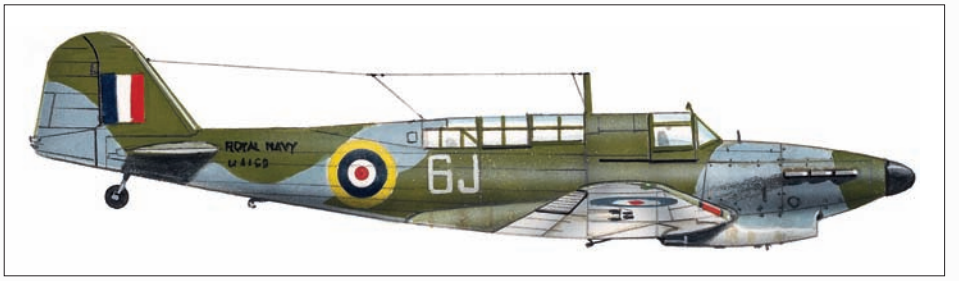
HMS *Ark Royal*

One of the conditions of the 1922 Washington Treaty was that Great Britain would refrain from building any new aircraft carriers for ten years, although it could convert existing warships within the tonnage limits imposed by the treaty. However, in 1931 the Admiralty began drawing up plans for a new purpose-built carrier – the first since the commissioning of HMS *Eagle* in early 1924. At the time the British government was trying to impose a new treaty limit of 23,000 tons on carrier displacement, so this was taken as the maximum size of the new vessel. The ship's hull length also had to be limited to 700ft so as to fit the navy's dry docks in Gibraltar and Malta.

HMS *FURIOUS*, 1941 AND HMS *EAGLE*, 1942 (INSET: FAIREY FULMAR)

HMS *Furious* (top) was laid down as a conventional battlecruiser, but a flying-off deck was fitted before the ship was completed. It was found that the high superstructure caused wind eddies that made landing difficult, so in 1921 *Furious* was converted into a fully-decked aircraft carrier. She was modified again in the 1930s, and by 1939 she had been fitted with a small island. The vessel was capable of carrying 30 aircraft, making her a useful if somewhat unattractive member of the fleet. For the first 18 months of the war she served in home waters, providing support for convoys, and covering Allied operations in Norway. After a refit in the United States and a brief foray to North Africa she returned to the Home Fleet in early 1943, and spent the rest of the war harrying German shipping off the Norwegian coast.

By contrast, HMS *Eagle* (bottom) spent most of her service career with the Mediterranean and Eastern Fleets. She was built for the Chilean Navy, but after her requisitioning by the Admiralty in the First World War she was converted first from a battleship into a seaplane carrier, then into an aircraft carrier in 1924. By 1939 she had been updated slightly, and carried 24 aircraft. During the war she served with the Mediterranean Fleet, and helped ferry much-needed aircraft to Malta. She was torpedoed and sunk by U-73 in August 1942, while taking part in Operation *Pedestal*.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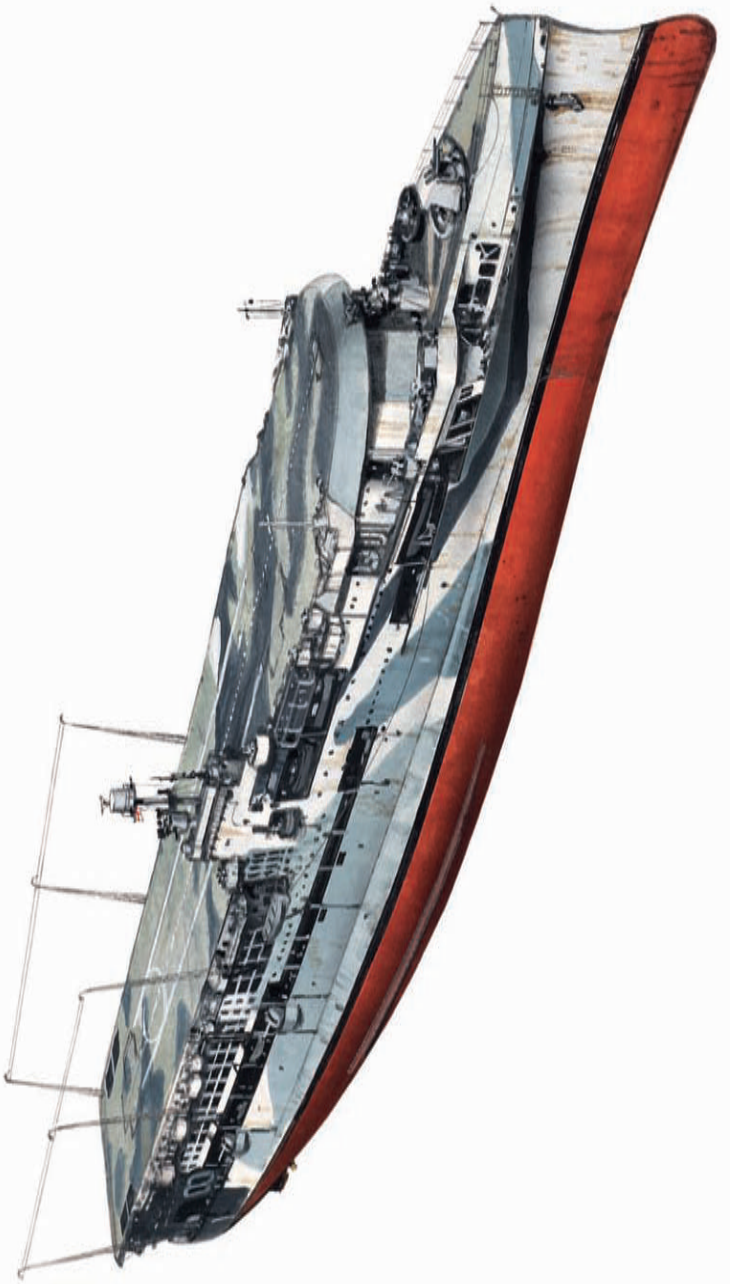
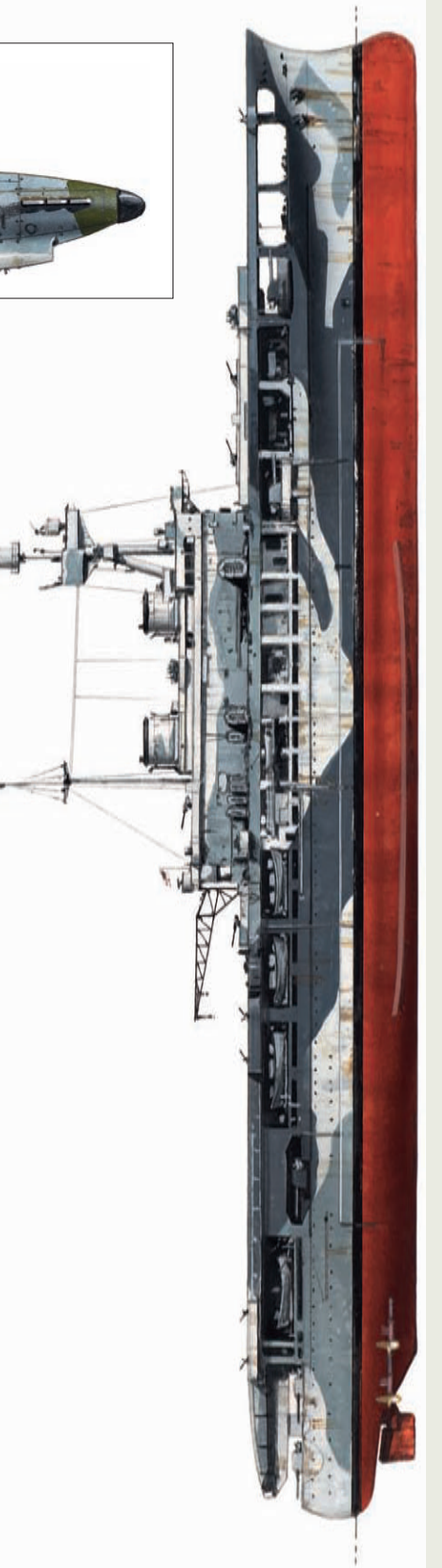
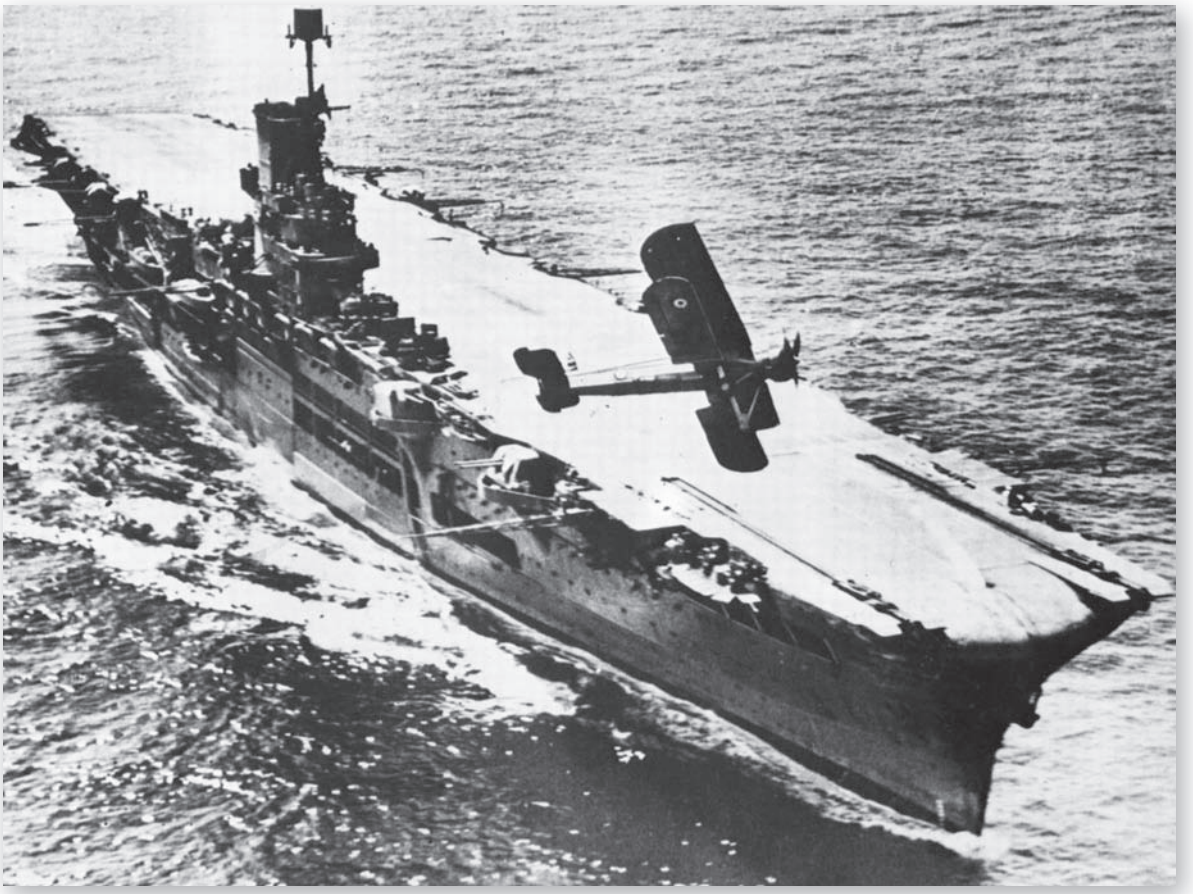






HMS *Ark Royal* was commissioned in November 1938 as the Royal Navy's first new aircraft carrier in 15 years. This powerful, modern addition to the fleet is pictured being overflown by a Fairey Swordfish torpedo-bomber, which constituted the carrier's main offensive weapon.

The result was a warship that would set a new direction in the design of British aircraft carriers. For a start, Sir Arthur Johns, Director of Naval Construction from 1930, insisted that the flight deck should be the main structural deck of the vessel. This 'strength deck' gave the hull its rigidity. On British fleet carriers up to that point the strength deck had been the main deck, several decks lower down, just as it would have been on a conventional warship. This meant that the hangar and flight deck effectively sat on top of the vessel. With the new design the strength deck, hangar and flight deck would all form one integrated whole. In effect the new vessel established the look of the British aircraft carrier, with her long flight deck jutting squarely over the bow and stern, the streamlined island, and the sloping bow and transom which helped reduce keel length.

Continued parsimony delayed the ordering of the new carrier beyond the tenth anniversary of the Washington Treaty, and only in September 1935 was the keel finally laid down at the Cammell-Laird shipyard in Clydebank. At this point the vessel was designated *Ark Royal* – a name which had last been given to a seaplane carrier of the First World War, subsequently renamed *Pegasus*. At the time it was expected that *Ark Royal* would cost close to £3 million, making this the most expensive ship ever built for the Royal Navy. The vessel was launched in April 1937, and fitting-out took another 18 months. HMS *Ark Royal* was finally commissioned in November 1938, fewer than ten months before the outbreak of the Second World War.

As well as an innovative hull design, *Ark Royal* boasted several other features that set her apart from previous British carriers. For a start, she had an integrated

anti-aircraft armament of eight twin-mounted 4.5in guns, backed up by a fire-control director. The guns were dual-purpose, mounted high up on the level of the flight deck to give them a good field of fire – they could even fire across the flight deck if they had to. The only drawback was that the turrets were open-backed, making them vulnerable to bombs. The ship also boasted four (later six) eight-barrelled 2pdr pom-poms on the port side, or else mounted fore and aft of the island. Finally, eight four-barrelled 0.5in machine guns were mounted on the corners of the flight deck, providing a last-ditch form of anti-aircraft defence.

The carrier had two hangar levels (as had been the case with carriers of the Courageous Class), giving her the capacity to handle up to 60 aircraft. The spacious flight deck – 800ft long and 94ft wide – was fitted with three small lifts, all set slightly off the centreline to avoid compromising the strength of the hull. Two hydraulic steam-powered catapults were fitted in the bow, greatly increasing the ability to launch aircraft quickly and effectively. Other innovations aimed at improving air operations included the fitting of cross-deck arrester gear towards the rear of the flight deck, landing lights to assist recovery at night or in poor daytime visibility, and a radio homing beacon mounted on the mast to guide aircraft home.

The flight deck of HMS *Ark Royal*, crowded with Swordfish torpedo-bombers just prior to launching a large 'strike' as part of an exercise. These aircraft would take off one at a time, with airborne aircraft circling the carrier until their companions joined them.

Propulsion was provided by three Parsons turbines and three pairs of Admiralty boilers, arrayed in three parallel rooms spanning the beam. However, this proved a fatal weakness, as it left the carrier vulnerable to flooding should the boiler room or engine room be hit by a torpedo. This was indeed to prove the ship's undoing. To protect against torpedoes the hull was double-skinned – the idea being that the torpedo would detonate against the outer hull, leaving the inner hull behind it undamaged – but unfortunately this theory proved less than effective when put to the test.

Teatime in the engine room artificers' mess on HMS *Ark Royal*, photographed during the first year of the war. These marine engineering specialists were regarded as non-commissioned officers, and enjoyed better conditions than most other sailors on board the carrier.

The Illustrious and Implacable Classes

By the early 1930s it had become clear that there was little international support for further naval treaties. An indication of growing international tension was Britain's abandonment of the 'Ten-Year Rule' in 1932. The London Naval Treaty (1930) achieved little, and by the time the Second London Naval Treaty (1936) was signed both Japan and Italy had opted out of any agreement. The new treaty renewed the 23,000-ton displacement limit for new aircraft carriers, and British naval planners immediately began working on designs for a new class of carrier based on the design of *Ark Royal*, at that time under construction.

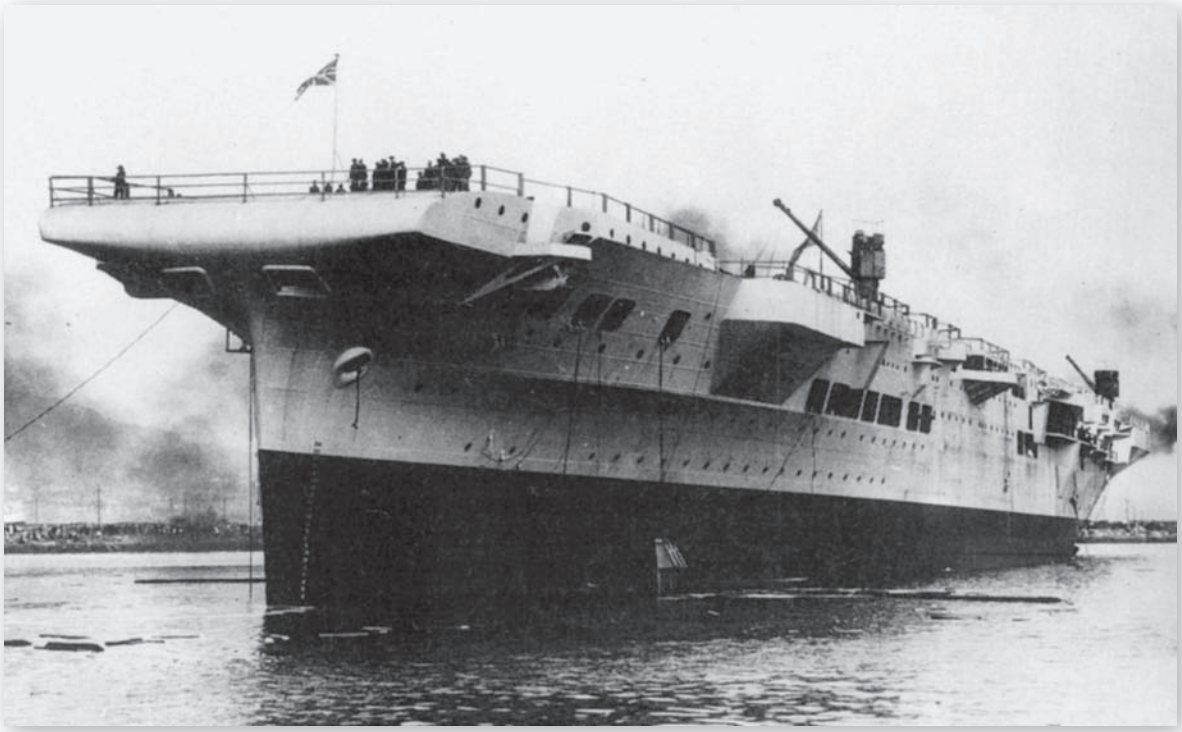
In 1936 the Admiralty introduced a new building programme, which included the construction of two more aircraft carriers. The Third Sea Lord, Sir Reginald Henderson, was a former commander of *Furious* as well as Rear-Admiral, Carriers. He realised that the greatest threat to these new carriers in European waters would be posed by land-based aircraft. After all, the carriers would be fast enough to escape from enemy surface ships, while a screen of escorts was expected to protect them from submarines. Henderson's answer to this air threat was to ensure that the new carriers were well protected by armour and that their flight decks could withstand a direct hit by a 500lb bomb.

THE SINKING OF HMS *ARK ROYAL*, AUGUST 1941

On 11 November 1941 the aircraft carriers *Ark Royal* and *Argus* slipped out of Gibraltar, escorted by the battleship *Malaya*, a cruiser and seven destroyers. When they came within range of Malta the carriers launched a total of 34 Hurricanes – reinforcements for the beleaguered island garrison. Having accomplished its mission, the naval force turned around and headed for home. In the mid-afternoon of 13 November the Rock of Gibraltar was sighted, meaning that within 90 minutes the carriers would be safely in port. *Ark Royal* was flying combat air patrols as a routine precaution, but when disaster struck it came from beneath the sea rather than above it.

At 3.41pm the carrier was struck by a single torpedo amidships on the starboard side. The ship immediately began to list heavily, so Capt Loben Maund gave the order to evacuate all non-essential personnel, leaving a skeleton crew to try to nurse the stricken carrier into port. It was no use. The torpedo had struck the boiler room, and the flooding could not be checked. Soon all power was lost, and the carrier was taken in tow. By 3am on 14 November the list had became too great to save the vessel, and the order was given to abandon ship. *Ark Royal* sank at 6.13am, watched by almost all her crew. There was only one fatality – a seaman who had been killed in the initial explosion – the only other casualty being the pride of the Royal Navy, which had lost one of its finest fighting ships.

G74
G74



HMS *Formidable* was launched at the Harland & Wolff shipyard in Belfast in August 1939. Carriers of the new-breed Illustrious Class entered service in 1940–41, and were soon pitched into the thick of the fighting in the Atlantic and Mediterranean.

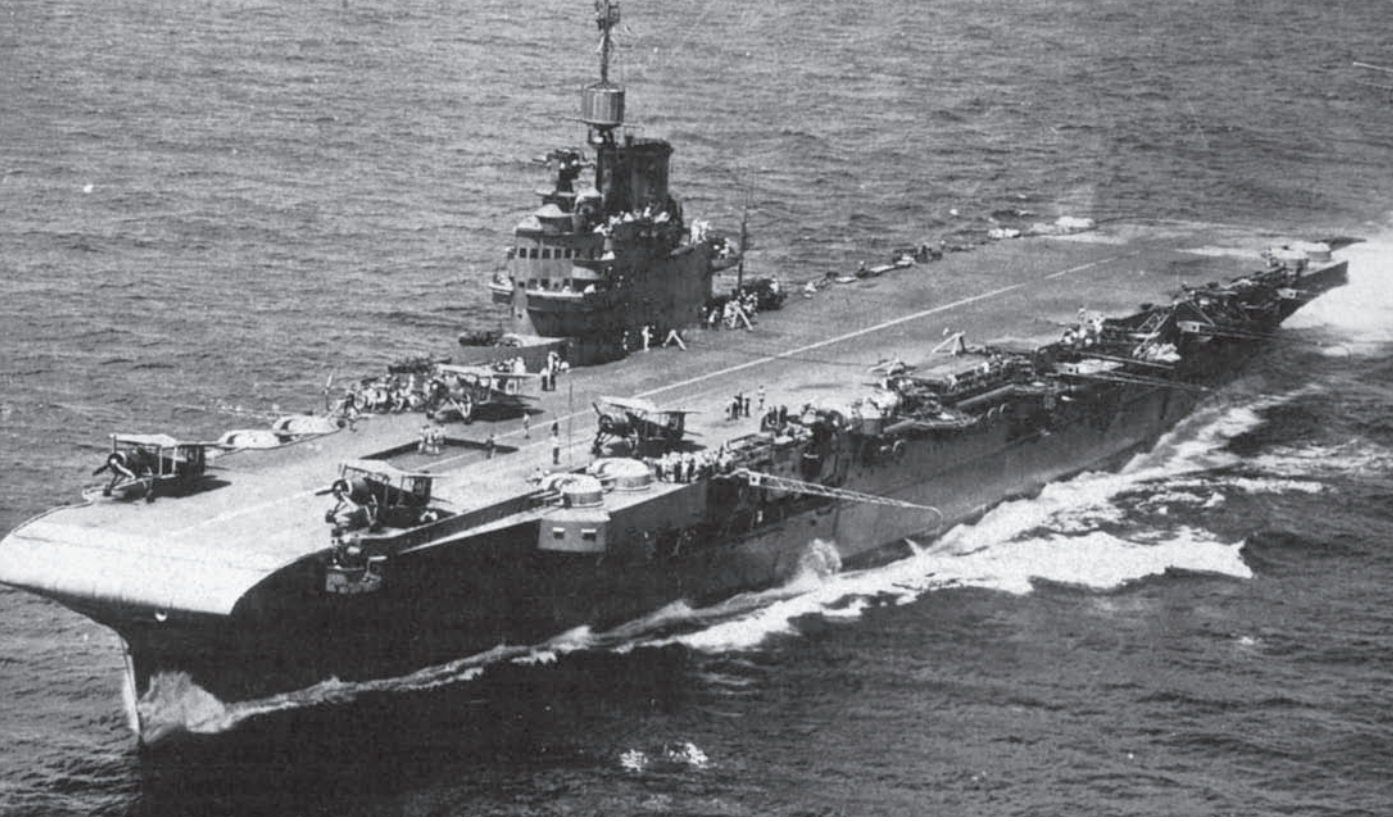
The result was a new breed of armoured fleet carrier – the first-ever vessels of their kind. The job of designing these new vessels was given to William Forbes, the navy's chief carrier designer.

Any form of naval construction requires a compromise. For aircraft carriers the design has to balance speed, protection and aircraft capacity. The extra level of protection afforded these new carriers – whose type was designated as the Illustrious Class – meant that one of the other two elements needed to be sacrificed. It was decided that the extra armour would make the vessels top-heavy, so where the *Ark Royal* had two decks of hangars these new carriers would have only one. This lowered the centre of gravity, but also halved hangar space, so the ships could handle fewer aircraft. *Ark Royal* had a capacity of 60 aircraft, but the new carriers would be limited to just 36 aircraft apiece.

The key feature of these new carriers would be their 'armoured box'. The top of this was the flight deck, protected by 3in (75mm) of armour, and the 'box' ran the whole length of the ship, to encompass the entire hangar. The sides were protected by 4½in (112.5mm) of armour, with armoured bulkheads of the same thickness fore and aft. The box then merged with the armoured belt which protected the carrier's vitals – the propulsion system, fuel tanks and magazines. The hangar itself was 458ft long, 62ft wide and 16ft high, and at a squeeze could hold 30 Fairey Swordfish torpedo-bombers and six fighters or dive-bombers.

The weak spots in the structure were the two lifts, situated one near each end of the flight deck. These needed to remain unarmoured if they were to be light enough to function. However, two mobile armoured screens could be rolled into place during 'action stations' to protect the hangar in the event of a bomb hit on a lift. A cunning ploy adopted in the Pacific was to paint fake lift outlines on the flight deck, so as to confuse enemy pilots and bomb-aimers.

The 1936 programme called for two carriers, but construction was delayed while Forbes worked out the specifications of the armoured box. His designs



HMS *Illustrious*, pictured in 1941 with four Swordfish torpedo-bombers arranged on her deck. It was *Illustrious* that launched the night attack on Taranto in November 1940 which virtually crippled the Italian battleship fleet. '*Lusty*' ended the war fighting in the Pacific.

were finally approved in December, and these first two vessels – *Illustrious* and *Victorious* – were eventually laid down during the spring of 1937. *Illustrious* was built at Barrow-in-Furness and *Victorious* on Tyneside. By this time the 1937 shipbuilding programme had been announced, which called for two more carriers of the same class. Consequently, *Formidable* and *Indomitable* were laid down in June and November of the same year, the first at Belfast, and the second at Barrow-in-Furness.

Construction of *Victorious* was plagued by a series of delays, but *Illustrious* was launched in April 1939, followed four months later by *Formidable*. By the time *Victorious* was launched by Lady Inskip (the wife of the Defence Minister) on 14 September, Britain was at war. Three days later HMS *Courageous* was sunk, making the need for new carriers even more pressing than before.

HMS *Illustrious* was commissioned in late May 1940, and joined the Mediterranean fleet three months later. The remaining three carriers would enter service between November 1940 and October 1941. All of these vessels proved extremely useful additions to the fleet, and the wisdom of protecting flight deck and hangar was demonstrated when first *Illustrious* and then *Formidable* were hit by German bombs, causing damage which would probably have sunk an unprotected aircraft carrier. Instead, both of these vessels were repaired and returned to the fray.

All four carriers underwent several minor modifications during the war. All had their flight decks extended slightly by adding a few extra feet to bow and stern. Like *Ark Royal*, the Illustrious Class carriers had eight twin 4.5in gun turrets, two each on each quarter of the flight deck. Each ship also carried six eight-barrelled 2pdr pom-poms, mounted in a similar configuration to *Ark Royal*. As the war progressed armament was augmented by additional light anti-aircraft guns – 20mm Oerlikon and 40mm Bofors guns in single, twin or quadruple mounts. A variety of radar types was fitted, most notably the Type 281 air warning set, supported by the Type 277 height-finding radar.

HMS *ILLUSTRIOUS*, 1940

Illustrious was built at Barrow-in-Furness and commissioned in May 1940, less than a month before the loss of HMS *Glorious*. She was the first of the four fleet carriers of the Illustrious Class, all of which had armoured hangars and flight decks, which limited their hangar capacity but gave them a useful degree of protection against enemy dive-bombers or *kamikaze* attacks.

In August 1940 '*Lusty*' joined the Mediterranean Fleet, and her squadrons soon earned a reputation for efficiency. The carrier's greatest triumph came on the night of 10–11 November 1940, when its Swordfish torpedo-bombers attacked the Italian fleet at Taranto, sinking one battleship and crippling two more. In June 1941 she was attacked by Axis aircraft while operating off Sicily. She was hit eight times, with one 500kg bomb penetrating her armour and exploding in the hangar. The ship was repaired in Norfolk, Virginia, and returned to the Mediterranean by way of the Indian Ocean, where she supported landings on Madagascar. Back in the Mediterranean she took part in Operation *Husky* (the invasion of Sicily), and flew patrols over the beachhead at Salerno. She ended the war as part of the newly-formed British Pacific Fleet. Off Okinawa the armoured flight deck proved its worth when *kamikaze* attacks failed to put the ship out of action. '*Lusty*' was finally scrapped in 1956.

HMS *Illustrious* (Illustrious Class fleet carrier)

Displacement: 23,000 tons (standard)

Dimensions: Length, 743ft 9in; beam, 95ft 9in; draught, 24ft

Propulsion: Three Parsons turbines, six Admiralty boilers, producing 111,000 steam horsepower.

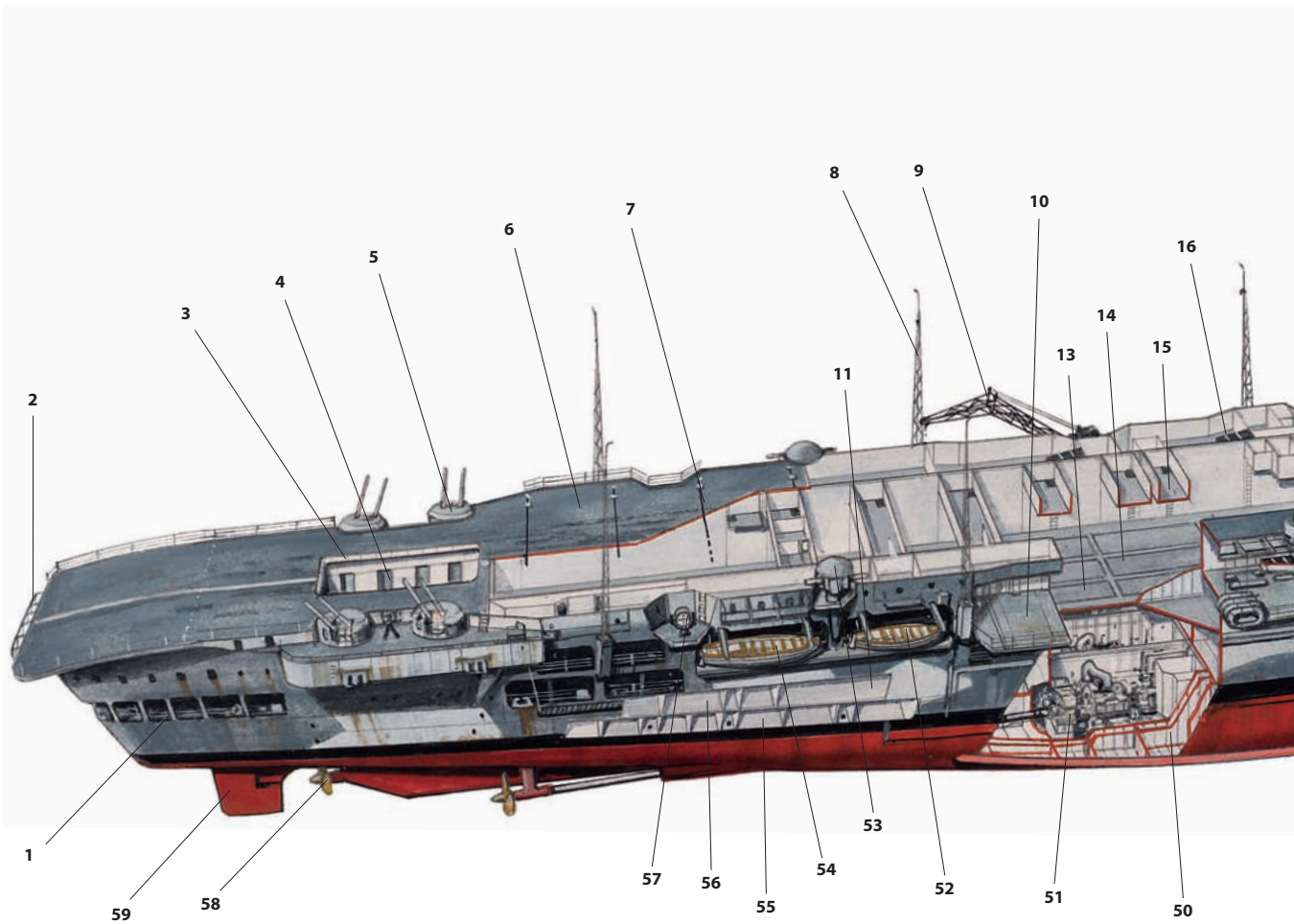
Speed: 30½kt

Fuel capacity: 4,850 tons

Armament: Eight twin 4.5in HA guns, six eight-barrelled pom-poms

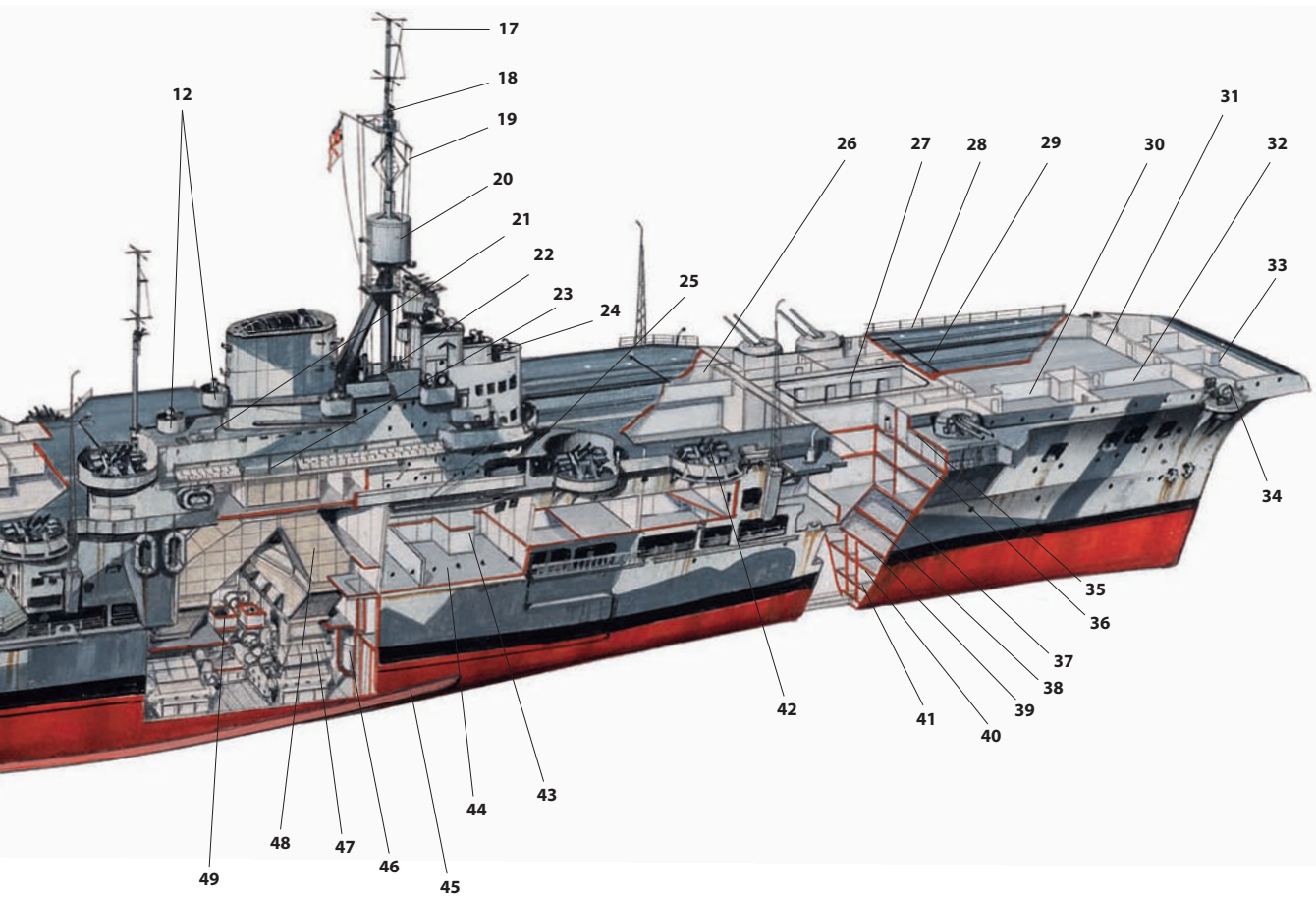
Aircraft capacity: 36

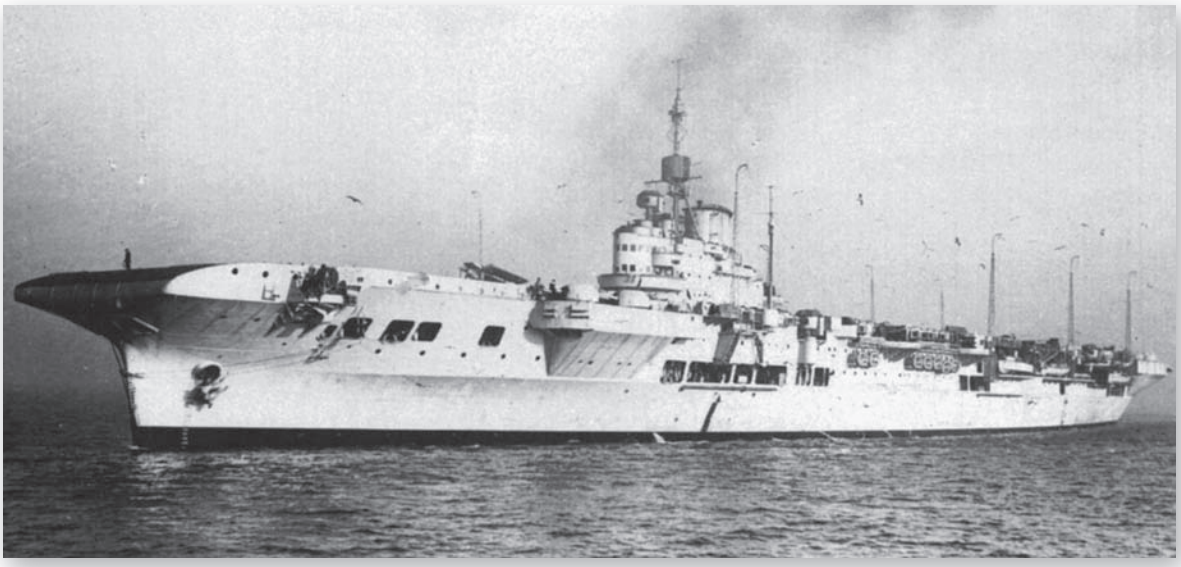
Armour: Flight deck, 3in; hangars and belt, 4½in



Key

1. Quarterdeck
2. Safety net
3. Aircraft lift
4. Balance weight trunks
5. 4.5in HA/LA twin mountings (8)
6. Flight deck
7. Arresting wires
8. Transmitting masts (raised)
9. 7 ton seaplane and boat crane
10. Deck for 32ft cutter (not shown)
11. Wardroom
12. Pom-pom directors
13. Hanger deck
14. Aircraft stowed positions
15. Stores
16. Engine room supply vents (4)
17. Type 27 IFF interrogator aerial
18. Type 79 air warning radar (replaced by Type 281 in December 1940)
19. Thermograph
20. Type 72 DM apparatus screen
21. D deck
22. C deck
23. B deck
24. Signal house top
25. A deck
26. Assisted take-off gear
27. Aircraft lift
28. Direction lights
29. Windscreen
30. PO recreation space
31. Crew recreation space
32. CPO recreation space
33. Mess
34. 44in searchlight projector
35. Upper gallery deck
36. Lower gallery deck
37. Upper deck
38. Main deck
39. Lower deck
40. Platform deck
41. Hold
42. Multiple Mk VI 2pdr pom-pom mountings (6)
43. Bomb lift
44. Mess
45. Bilge keel
46. Petrol tank
47. Boiler (6)
48. Boiler uptake
49. Boiler room vent
50. Oil fuel tanks
51. Engine room (3)
52. 27ft whaler (stowed)
53. HA direction tower
54. 32ft cutter (stowed)
55. Officers' cabins
56. Squadron leader's cabin
57. 44in searchlight
58. Propeller (3)
59. Single rudder





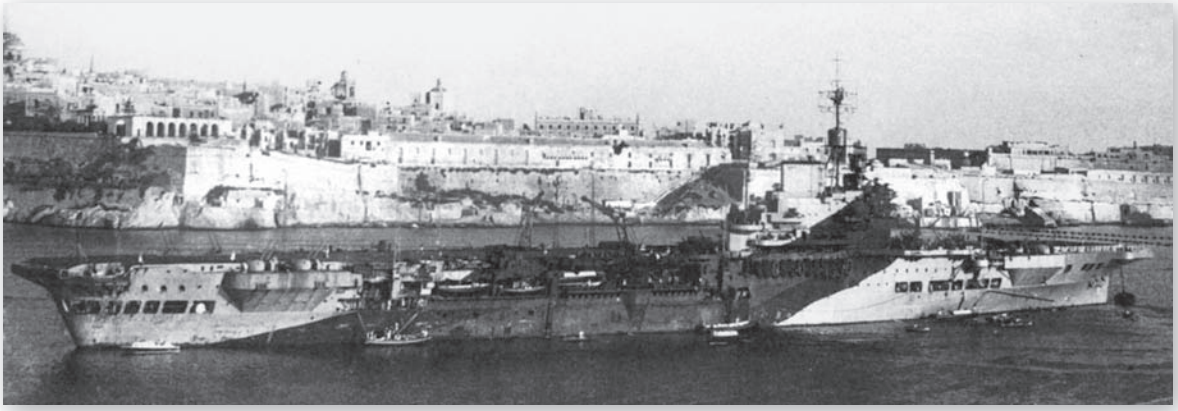
The second Illustrious Class carrier, HMS *Formidable*, took part in the Battle of Cape Matapan but was seriously damaged by German dive-bombers off Crete less than two months later. She was repaired, and sent to the Pacific in late 1944.

Together these sets provided fire control for the anti-aircraft guns, and an air-search capability.

The flight deck itself was fitted with a single hydraulic steam catapult to port of the centreline, with arrester wires across the after part of the flight deck. The latter were strengthened during the war to cope with larger and heavier aircraft, and in most cases the lifts were also upgraded. Another useful wartime innovation was the development of an aircraft deck park system utilising outriggers that extended from the flight deck designed to hold the tailwheels of aircraft. This meant additional aircraft could be parked on deck without interfering with flying operations. Consequently the four carriers' capacity increased from 36 to 52 aircraft apiece as the war progressed.

The 1937 naval programme called for two more carriers of the Illustrious Class (*Victorious* and *Indomitable*), but with slight modifications. Propulsion systems would utilise four turbines and propellers apiece rather than three, and the hulls of these carriers were slightly longer than those of their predecessors so as to accommodate the extra propulsion machinery. The other difference was much more significant. The last carrier of the Illustrious Class was HMS *Indomitable*, launched in March 1940. As the ship was nearing completion it was decided to reduce the thickness of the sides of the armoured box to just 1½in (37.5mm) and that of the belt armour to 3in (75mm). Flight-deck protection remained the same. This allowed more room for aircraft, especially when the height of the flight deck was raised by 14ft to accommodate a second hangar deck, although both of these were lower in height than the hangars on the three earlier carriers. This innovation gave *Indomitable* hangar space for 45 aircraft – nine more than any of her sister ships. The two new carriers of the 1938 programme (*Indefatigable* and *Implacable*) followed the same basic design as *Indomitable*, but received an extra ½in (12.5mm) of side armour to the armoured box.

These two new Implacable Class carriers were laid down at Clydeside shipyards in 1939, and launched in December 1942. They were commissioned in the summer of 1944 and served with the Home Fleet and Pacific Fleet. The planned extra aircraft capacity was a real boon, and with the aircraft deck park system this could be increased to an impressive 81 aircraft apiece – making these vessels the most commodious British carriers of the Second World War.



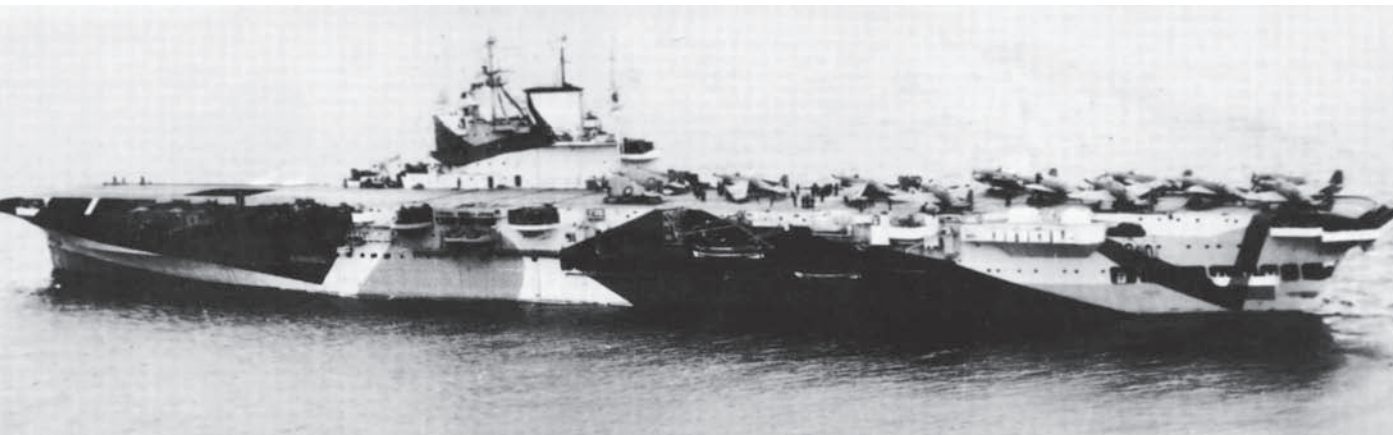
HMS *Illustrious* photographed arriving at Malta in August 1943, shortly before operating in support of the Allied landings at Salerno. This camouflage scheme – of light, medium and dark grey, and black – was used from June 1943 until May 1944.

Although this book is concerned with wartime fleet carriers, it is worth mentioning two other classes of full-sized British aircraft carriers ordered during the Second World War. In 1942 plans were drawn up for a new generation of fleet carrier. The plan was effectively for a slightly enlarged version of the Implacable Class, with a displacement of 24,000 tons. The first such vessel was *Audacious*, laid down in 1942, which was followed by a new *Ark Royal* in 1943 and *Eagle* in 1944. However, the latter ship was cancelled soon after the end of the war, and the name '*Eagle*' transferred to what had been *Audacious*. Both new carriers – *Eagle* and *Ark Royal* – were significantly altered while still under construction, mainly because they had to be adapted to carry jet aircraft. *Eagle* and *Ark Royal* entered service during the 1950s.

Another even more ambitious wartime project was the construction of the Malta Class of fleet carriers. These vessels were to be built on a scale to rival that of the latest US aircraft carriers, each with a displacement of almost 47,000 tons and a flight deck more than 900ft long. Four were ordered in the summer of 1943, but because the Clydeside, Tyneside and Belfast shipyards scheduled to construct them were fully committed to building other warships, all were scheduled to be laid down in 1945; however, in that year two were cancelled and the remaining two (*Malta* and *New Zealand*) rescheduled for later that year. However, the war ended before any work was begun, so that ultimately all four Malta Class fleet carriers were cancelled. That meant that by 1945 Britain had seven fleet carriers, although three more were being built and four more had been ordered. This was barely adequate given Britain's global commitments, but fortunately the Admiralty had already addressed the problem.

Light Fleet Carriers

As the war progressed there never seemed to be enough carriers. *Courageous*, *Glorious*, *Ark Royal*, *Hermes* and then *Eagle* were all lost, while at various



HMS *Indomitable* was the last of the Illustrious Class fleet carriers to enter service. She was badly damaged by bombs while escorting Malta convoys, by torpedoes during the invasion of Sicily, and by *kamikaze* aircraft in the Pacific, but nevertheless survived the war – bloodied but unbowed.

times *Illustrious*, *Formidable* and *Indomitable* were damaged and out of service while under repair. The venerable little *Argus* had been relegated to reserve status. Various solutions were considered, including conversion of the unfortunate *Vindictive*. The Admiralty eventually decided to institute a programme to crash-build 'intermediate aircraft carriers' – low-cost vessels that could be produced relatively quickly and could provide much-needed air cover for the fleet. The 'intermediate aircraft carrier' was soon reclassified as the 'light carrier'.

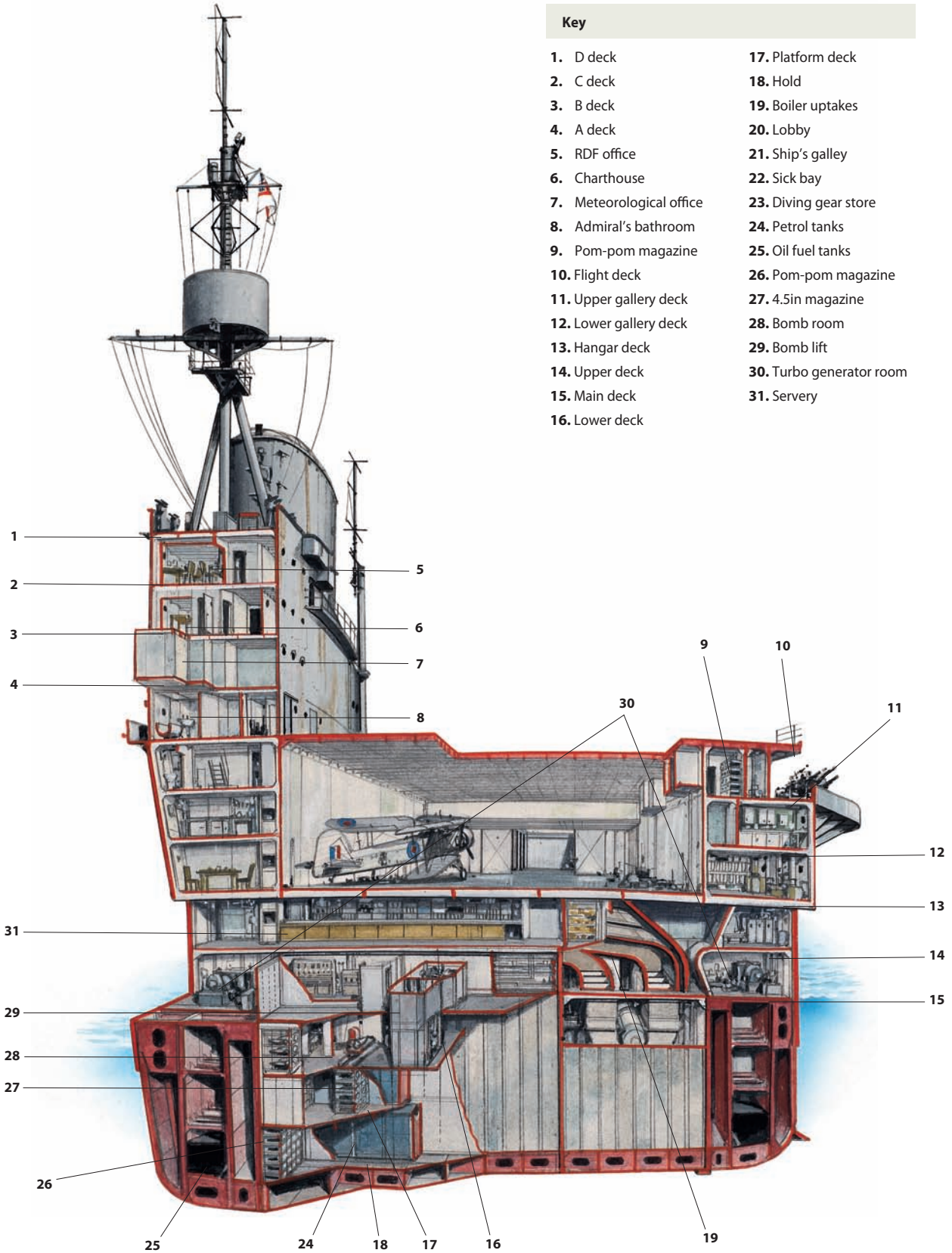
These light carriers would not carry armour, and at around 13,000 tons apiece would displace 10,000 tons less than fleet carriers of the Illustrious or Implacable Classes. Apart from that, they were effectively scaled-down versions of these earlier fleet carriers. These light carriers had a relatively large flight deck for their size. At 690ft long, and with a single 445ft hangar and two lifts, these small carriers could handle up to 37 aircraft – virtually the same number as the larger Illustrious Class armoured fleet carriers. A deck park system would increase this total to 48 aircraft.

The first of these light carriers was HMS *Colossus*, laid down at the Vickers-Armstrong shipyard on Tyneside in the summer of 1942. Seven more carriers of the Colossus Class would be laid down before the end of the year, with two more in January 1943. Of these, *Colossus* and two others were launched in 1943, followed by the remainder during 1944. *Colossus* was commissioned in December 1944, but of the remaining nine light carriers in the class only *Vengeance*, *Venerable*, *Glory* and *Ocean* would be commissioned before 14 August 1945 – the end of the war against Japan. Two light carriers were completed as aircraft maintenance ships, HMS *Pioneer* and HMS *Unicorn*.

Unicorn was a strange vessel which deserves a brief mention. She was laid down as a depot ship in June 1939, but other vessels were given greater priority so she was only completed in March 1943. By then she had been redesigned as a miniature carrier vaguely modelled on HMS *Ark Royal*. *Unicorn's* speed was only 24kt, as space which would usually be allocated to housing the engines was earmarked for workshops. That said, *Unicorn* actually served operationally as a light carrier in support of the Salerno landings in September 1943, and she was subsequently used as an escort carrier, then again as an operational carrier during the landings on Okinawa in April 1945. In effect she was used more as a light or escort carrier than as a depot or maintenance ship.

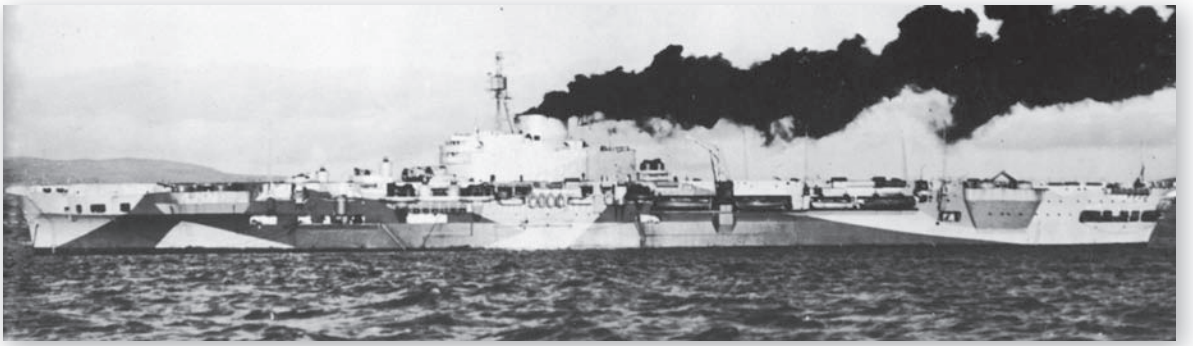
HMS *VICTORIOUS*, 1941 (MIDSHIPS SECTION)

Aircraft carriers might have been some of the largest warships of the Second World War, but they also had a lot to carry. Beneath the flight deck they were just as cramped as other more conventional warships – in fact even more so, as not only did they have to house the aircraft, aircrew, spare parts, fuel and munitions to keep the squadrons operational, but they also needed space for workshops and maintenance facilities, lift (elevator) machinery and extra fire fighting equipment or vehicles. The Illustrious Class fleet carrier *Victorious* is pictured here as she looked in the early summer of 1941, after she took part in the hunting of the *Bismarck*. Her hangers carried a total of 33 Fairey Swordfish torpedo-bombers and Fairey Fulmars fighters. By the standards of other navies these aircraft were either hopelessly obsolete or inadequate, but the air crews did what they could with them, and scored some remarkable successes. The Swordfish embarked on *Victorious* were replaced by marginally better Fairey Albacores in July 1941. Like her sister ship *Illustrious*, HMS *Victorious* had a single armoured hanger, serviced by two lifts. In this midships cross-section these aircraft facilities are clearly shown, while below them are machinery spaces, crew quarters, magazines and fuel tanks.



Key

1. D deck
2. C deck
3. B deck
4. A deck
5. RDF office
6. Charthouse
7. Meteorological office
8. Admiral's bathroom
9. Pom-pom magazine
10. Flight deck
11. Upper gallery deck
12. Lower gallery deck
13. Hangar deck
14. Upper deck
15. Main deck
16. Lower deck
17. Platform deck
18. Hold
19. Boiler uptakes
20. Lobby
21. Ship's galley
22. Sick bay
23. Diving gear store
24. Petrol tanks
25. Oil fuel tanks
26. Pom-pom magazine
27. 4.5in magazine
28. Bomb room
29. Bomb lift
30. Turbo generator room
31. Servery



HMS *Indefatigable* was the first of the two fleet carriers of the Implacable Class, which entered service in mid-1944. These carriers resembled those of the Illustrious Class, but with less armour around the hangar decks they could carry more aircraft.

This raises the issue of escort carriers. While it is beyond the scope of this book to cover these in any detail, the reasoning behind their construction is worth mentioning. At the start of the war, any plans to use fleet aircraft carriers to help hunt down U-boats were thwarted by the sinking of HMS *Courageous* in September 1939. Fleet aircraft carriers were seen as too vulnerable to use in this way. However, at the height of the Battle of the Atlantic the idea was resurrected, except this time the primary role of the carrier would be to protect the convoy through reconnaissance or by keeping enemy reconnaissance aircraft at bay. Only later were escort carriers used as U-boat hunters. The first of these escort carriers was HMS *Audacity*, which entered service in the summer of 1941. She was sunk in December, but during her six months' service she proved her worth, and dozens of similar 'Woolworth carriers' were ordered.

Escort carriers did exactly that – they escorted convoys. They lacked the aircraft to function as fleet carriers, although several were pressed into service in support of the fleet. For instance, during the 1943 Salerno landings, while *Illustrious* and *Formidable* provided fighter cover for the fleet, the light carrier *Unicorn* and the escort carriers *Battler*, *Attacker*, *Hunter* and *Stalker* protected the fleet by searching for U-boats and enemy surface ships.

Two other groups of light fleet carriers were laid down during the war, but did not enter service before the end of hostilities. The Majestic Class consisted of six light carriers similar to those of the Colossus Class, except that their decks were strengthened, so they displaced an additional 1,000 tons apiece. All were laid down in 1943, with five of the six (*Magnificent*, *Powerful*, *Majestic*, *Terrible* and *Leviathan*) launched before the end of the war. The sixth vessel of the class – *Hercules* – followed in September 1945.

HMS *Glory*, one of ten Colossus Class light carriers, was laid down in 1942, but like most of her sister ships only entered service during the final weeks of the war. These effectively represented scaled-down versions of the Illustrious Class.

Representing an enlarged version of the Colossus and Majestic Classes were the eight light fleet carriers of the Centaur Class, four of which were laid down in 1944–45. Work had still not begun on the remaining four vessels when the war ended, so these orders were cancelled. These carriers

each displaced 18,300 tons and had a single hangar deck capable of handling 42 aircraft. The original four – *Albion*, *Bulwark*, *Centaur* and *Hermes* – all entered service during the 1950s, and while two of them were converted into commando ships, *Centaur* and *Hermes* were still serving as aircraft carriers three decades later. In fact, HMS *Hermes* was the last remaining British fleet carrier, and survived long enough to take part in the Falklands Campaign of 1982.

With the exception of HMS *Unicorn*, only five of the 20 light carriers were commissioned in wartime. The light carriers may have been intended as an intermediate solution, but arrived in time for what was then seen as a looming tumultuous final battle against Japan. Only the use of the atomic bomb and Japan's subsequent unconditional surrender spared the Royal Navy further losses of ships, aircraft and men.

A Fairey Swordfish torpedo-bomber, pictured launching its 21in torpedo. Although obsolete by the Second World War, this biplane – known as the 'Stringbag' by its crews – still scored some spectacular successes, and remained in use on board British aircraft carriers until 1943–44.

OPERATIONS

Flight-Deck Operations

Taking Off

Before the war, the handling of aircraft on board British aircraft carriers evolved into a reasonably efficient system, which remained in use throughout the Second World War. In most cases a mission such as a strike, a search-and-sweep or a combat air patrol would be planned beforehand by the 'Commander Air Staff', a title which by 1941 had become 'Commander (Ops)'. This officer would brief the aircrews in the aircraft control room (or air intelligence office) before the mission, often before dawn. While this was taking place the ground crews would arrive to prepare the aircraft, either in the hangar or on the flight deck itself. This usually took place an hour before flying operations began.

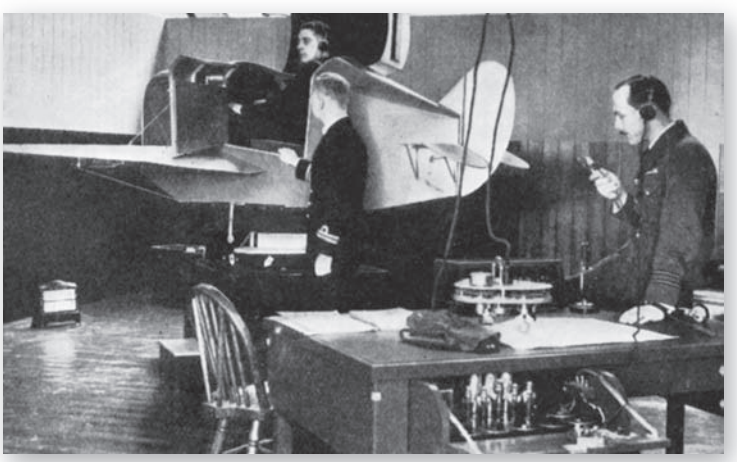
In the Fleet Air Arm aircraft maintenance crews were divided into air mechanics, air fitters (riggers) and air artificers – the latter being specialists who dealt with any mechanical or physical problem with the aircraft itself. Fitters dealt with the airframe, mechanics the engine. There were further specialists who looked after electrical circuits, while ordnance ratings supervised the arming of the aircraft. Normally two air mechanics were allocated to each aircraft, while a fitter was responsible for a pair of aircraft. One or two artificers would oversee work on several aircraft. The whole team came under the jurisdiction of the air engineering officer, who was in charge of maintaining all the aircraft in a hangar, or a squadron.

Once an aircraft was ready it would be wheeled to the lift if it was still in the hangar, and then taken up to the flight deck. At this stage its wings would still be folded. The lifts were operated by the ship's engineers rather than Fleet Air Arm mechanics. The plane would then be handed over to the ranging

Fleet Air Arm aircrews being briefed prior to a mission. These sessions served to ensure that everyone knew what to do and what to expect during a mission. Naval intelligence officers would also debrief the survivors on their return.

party, which would 'range' or place the aircraft in its take-off position. Then the pinning party would take over – chocking the aircraft so it remained in place and unfolding the wings. The ground crew would then reappear and start up the aircraft, so all the aircrew needed to do was to climb in and take off. Actually, the aircrew could do little else as they would already be encumbered with bulky flying suits, flying holdalls, charts marked with their course, and often a packed meal. Once they had clambered into their aircraft the latter were ready to be launched.

The man controlling the whole operation was the flight deck officer (FDO, or 'Fido'). When the leading aircraft came to full power he would signal the Commander (Flying), who was watching operations from the bridge. At that point the Captain would turn the carrier into the wind and give the order to lower the wireless masts, which usually flanked the flight deck. In most cases these also had safety netting strung between them, to guard against mishaps. When 'Commander (F)' gave the signal the FDO would order 'chocks away', then give his permission to the lead aircraft to take off.

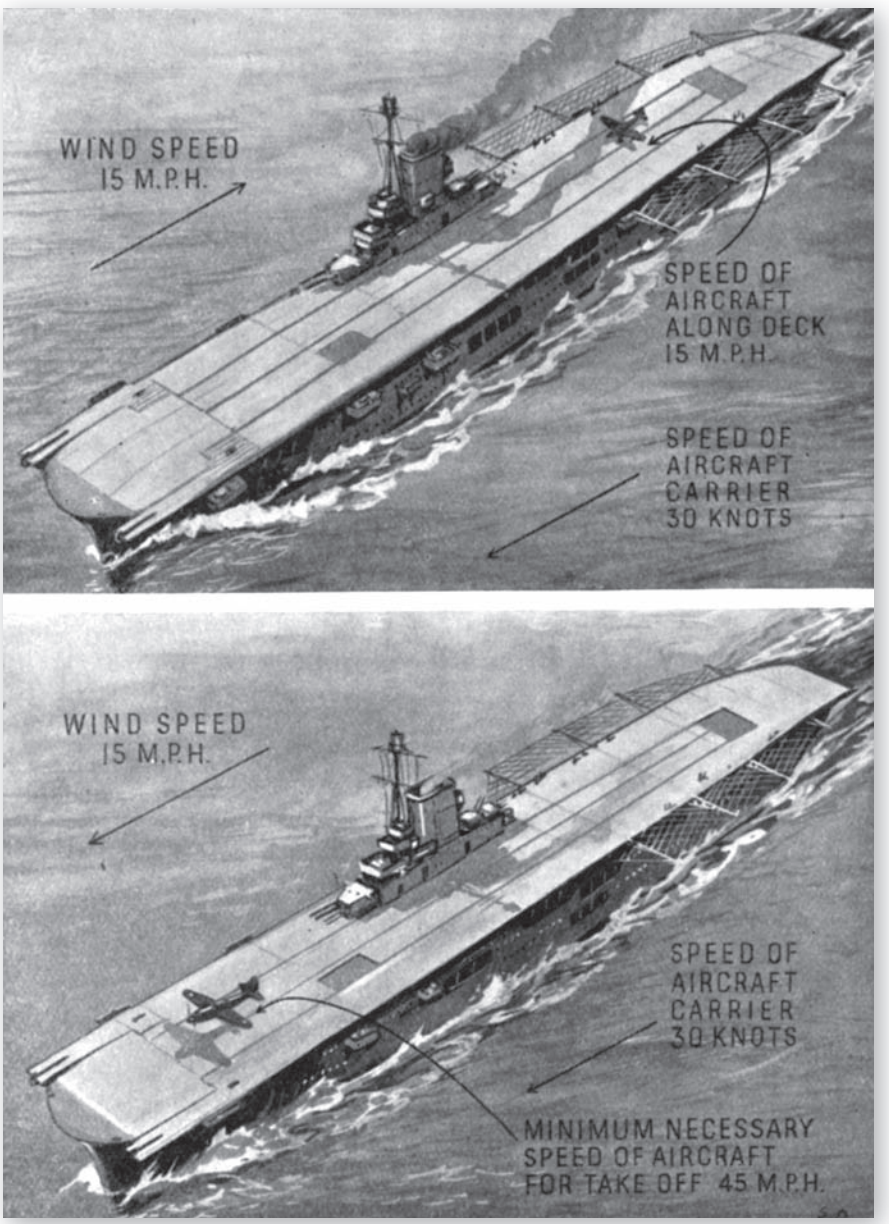


A land-based trainer was used to teach Fleet Air Arm pilots the basics of flying. Despite its extremely primitive appearance this contraption, known as 'The Crab', was reasonably effective, being used by hundreds of fledgling pilots before they moved on to real aircraft.

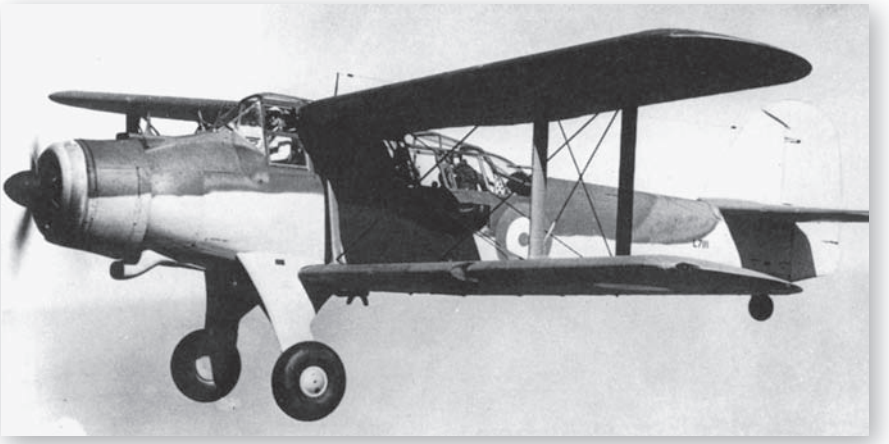
Before the use of hydraulic steam-powered catapults the aircraft would simply rev up and take off. The take-off speed of the older biplanes used by the Fleet Air Arm was surprisingly low – a Swordfish only needed a take-off speed of around 60mph. If the carrier was steaming into the wind at 30kt the speed necessary became just 30kt less the speed of the oncoming wind. In a 10kt breeze the Swordfish only needed to accelerate to 20mph before it became airborne.

That means that aircraft could simply rev their engines and take off, one after the other. Airborne aircraft would circle the carrier until the full complement had joined them, then they would set off on their mission.

With a catapult (or accelerator) things were a little more complicated. The ranging party would position the aircraft at the rear of the catapult, and a towbar would be fitted to a front wheel of the aircraft, which linked it to the shuttle on the catapult. Another ship's mechanic operated the catapult, under the guidance of the flight deck staff. When the order to launch was given he would release the high-pressure steam, and the shuttle would fly forward along the track, and – all going well – throw the aircraft off the end of the flight deck and into the air, at a velocity well above its take-off speed. By that time the next plane would be in position, and the shuttle on its way back to be coupled up, ready for the next launch. Any faulty aircraft would be quickly



The basics of carrier operations are illustrated in this wartime training manual. To reduce the speed her aircraft needed to take off, the carrier steamed into the wind at full speed.



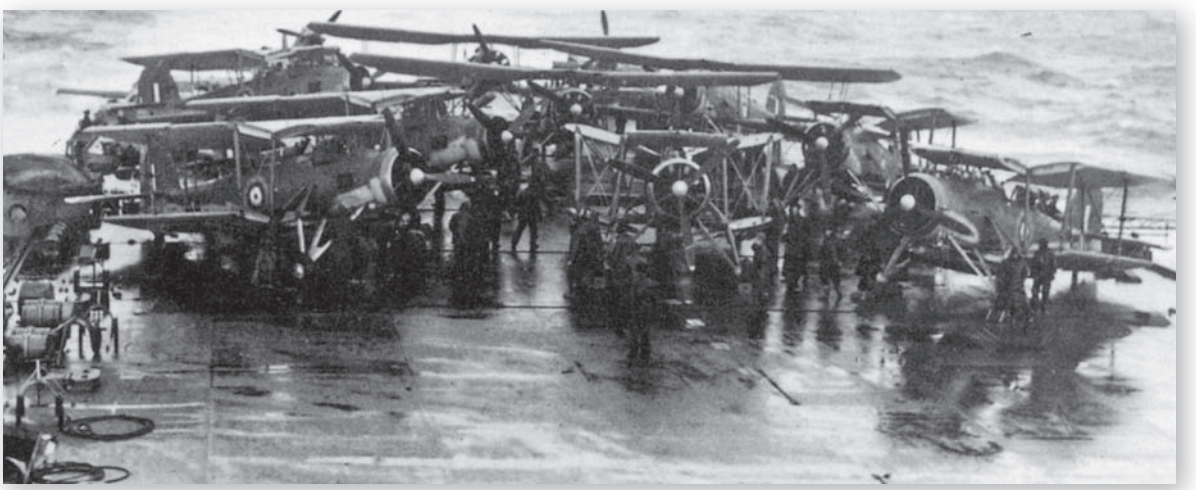
The Fairey Albacore was intended to replace the Swordfish, but just like its predecessor this biplane was slow and outdated. It entered service in 1941 and served alongside the Swordfish. However, it proved less agile even than its predecessor, and was withdrawn from use in 1943.

pulled aside, and the ground crew would race to fix the problem before the end of the launch so it could still participate in the mission.

Landing On

The procedure for landing aircraft was just as methodical. When the returning aircraft were close to the aircraft carrier the Captain would turn the vessel into the wind again, and the ground crew would be ordered: 'Stand by to receive aircraft'. To help pilot visibility the carrier was usually turned slightly so that the wind crossed the flight deck from port to starboard, blowing the funnel exhaust away from the flight deck. The last thing a pilot wanted was an unexpected area of turbulence just as he was making his final approach.

In many aircraft the pilot was unable to see the flight deck clearly because the nose of the aircraft blocked his line of vision. He therefore relied on the Deck Landing Control Officer (DLCO), who waved him down using bats, indicating 'left', 'right', 'too high', 'too low' and so on. Most DLCOs were experienced pilots themselves, and their skill played a large part in ensuring safe carrier operations before the postwar introduction of non-manual landing systems. Before a plane touched down the pilot would deploy his hook, which was designed to snag in the carrier's steel arrester wires. Once down he throttled back and released the brakes, which eased the strain on the arrester cable and allowed the plane to be unsnagged. Two members of the Pinning Party released the aircraft and signalled this to the pilot. Meanwhile



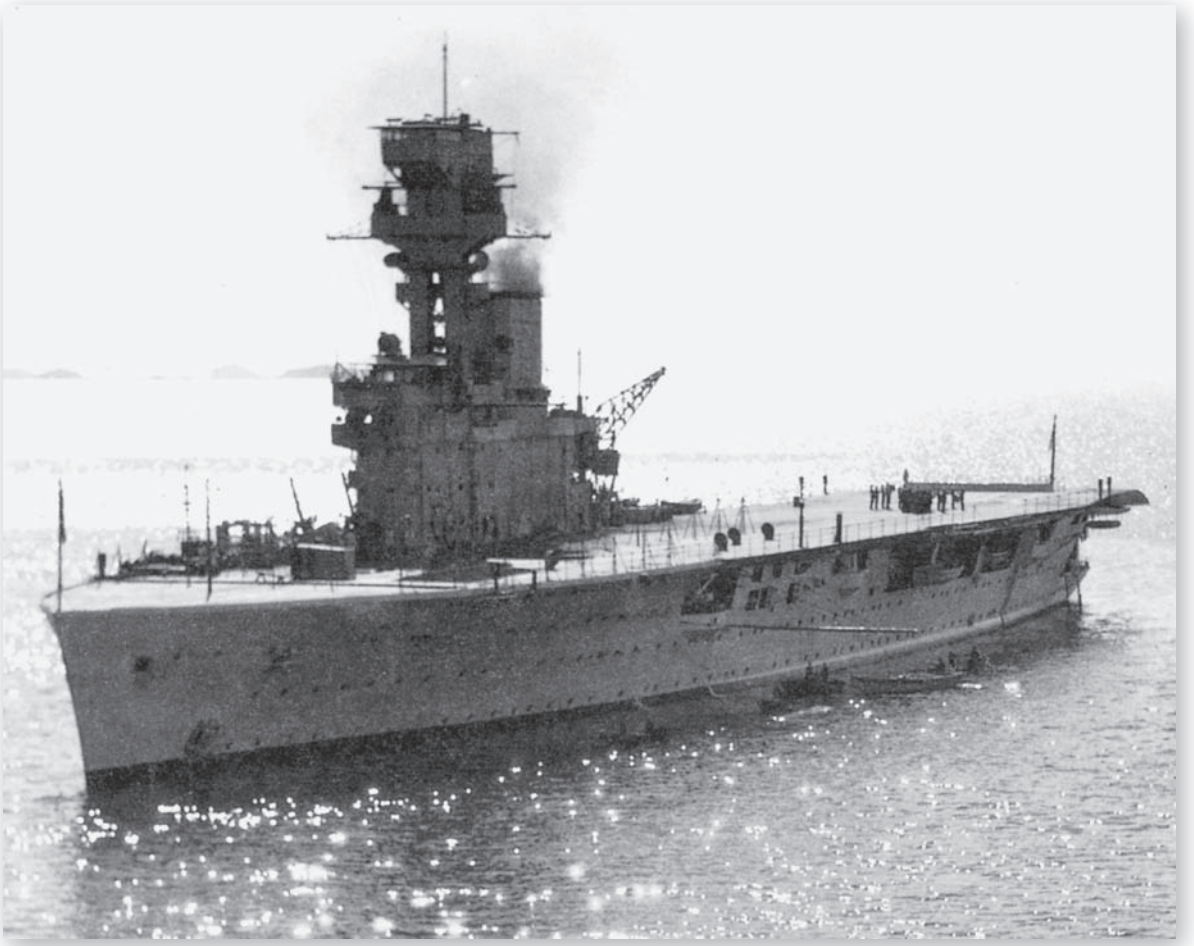
A group of Swordfish torpedo-bombers ranged near the stern of HMS *Victorious* during her pursuit of the German battleship *Bismarck* in May 1941. Although their wings are folded the aircraft are armed and could be readied for launch within 20 minutes.

the arrester wire would be mechanically drawn back to its original position, ready for the next aircraft. On an Illustrious Class aircraft carrier eight arrester wires spanned the after half of the flight deck. After being released the pilot would taxi slowly forward, while two more men held on to the wings, helping to guide the aircraft across the deck.

The next procedure was known as 'striking down'. The wings of the aircraft would be pinned up again either by the ground crew, or in later aircraft power-folded from the aircraft itself. The aircraft would then taxi over the crash barrier that marked the end of the landing area and either move towards a lift ready for being taken down to the hangar, or else moved further up the deck, ready to prepare for another immediate sortie. In all British aircraft carriers, the front half of the flight deck was designated the take-off area, while the rear half was earmarked for landing operations. The crash barrier was a net resembling a large tennis net, designed to ensnare any aircraft that overshot the landing area or failed to snag one of the arrester wires.

Once all planes were recovered the aircraft carrier would turn back onto her original course. Accidents were all but inevitable, and during taking-off and landing-on an emergency crew of firemen dressed in asbestos suits was standing by, ready to deal with any emergency. Similarly, all British carriers had vehicles ready to tow a damaged aircraft clear or push any dangerously flaming wreckage over the side. Flying was a dangerous business, as was the operation of aircraft on a rolling, moving warship. It is testimony to the skill of aircrew, ground crew and ships' companies that the high wartime casualty figures for Fleet Air Arm personnel were not even more alarming.

A Supermarine Seafire, the naval version of the land-based Spitfire, photographed after a crash landing on the deck of HMS *Implacable* in November 1944. These fighters were generally considered too fragile for naval use, but remained in service from mid-1942 until the end of the war.



HMS *Hermes*, the Royal Navy's first purpose-built aircraft carrier, entered service in 1923 and spent most of the interwar years in the Far East. This obsolete small carrier was sunk by Japanese naval aircraft off Ceylon in April 1942.

Service History 1939–45

HMS *Furious*

Furious initially served with the Home Fleet, and was engaged in convoy protection and carrying Britain's gold reserves to safety in Canada. She flew strikes in support of the Allied operations in Norway (1940), then remained in home waters until the summer of 1941, when she joined the Mediterranean Fleet. She operated in support of the Malta convoys and took part in Operation *Pedestal* (the relief of Malta). She was sent to Norfolk, Virginia, to refit in October 1942, before taking part in Operation *Torch* (the Allied landings in North Africa) in November. She rejoined the Home Fleet in February 1943, but her age kept her from playing an active role, apart from participation in Operation *Tungsten* (the airstrike against *Tirpitz*) in August 1944. She was placed in reserve the following month.

HMS *Argus*

Argus began the war as a training carrier, but was occasionally used to ferry aircraft and as a convoy escort. After the loss of *Ark Royal* in November 1941 *Argus* was recalled to active duty, and joined Force H in Gibraltar. She operated in support of the Malta convoys, and in November 1942 participated in Operation *Torch*. *Argus* resumed her training-carrier role in early 1943, and in December 1944 she was decommissioned and turned into an accommodation ship.

HMS *Hermes*

Hermes was being used as a training ship when war broke out, but she was soon searching for German raiders in the Atlantic, and used to support transatlantic convoys. In July 1940 she launched strikes against Vichy French warships in Dakar before resuming her earlier duties. In early 1941 *Hermes* launched strikes against Italian targets in East Africa, but was damaged in a collision in July. After repairs in Cape Town and Durban she joined the Eastern Fleet, participating in sweeps in search of Japanese naval units in the eastern Indian Ocean. However, it was the Japanese who found the British ship. On 9 April 1942 *Hermes* was attacked off Ceylon by aircraft from a veteran Japanese carrier group. Hit by more than 40 bombs, she sank with the loss of more than 300 lives.

HMS *Eagle*

Eagle began the war in the Far East, and was employed hunting German raiders and escorting convoys. In March 1940 she was damaged by an accidental explosion in a bomb room, and was sent to Singapore for repairs. She returned to service in May, joining the Mediterranean Fleet. From June 1940 she launched strikes against Italian shipping and supported convoy operations. In April 1941 *Eagle* was sent into the Indian Ocean and South Atlantic to hunt for raiders, before returning to Britain for a refit in October. *Eagle* returned to the Mediterranean in February 1942, joining Force H in Gibraltar, and was used to protect the Malta convoys. In August she took part in Operation *Pedestal*. On 11 August 1942 she was attacked by U-73 south of Majorca and hit by four torpedoes. She sank within eight minutes, with the loss of 260 crew.

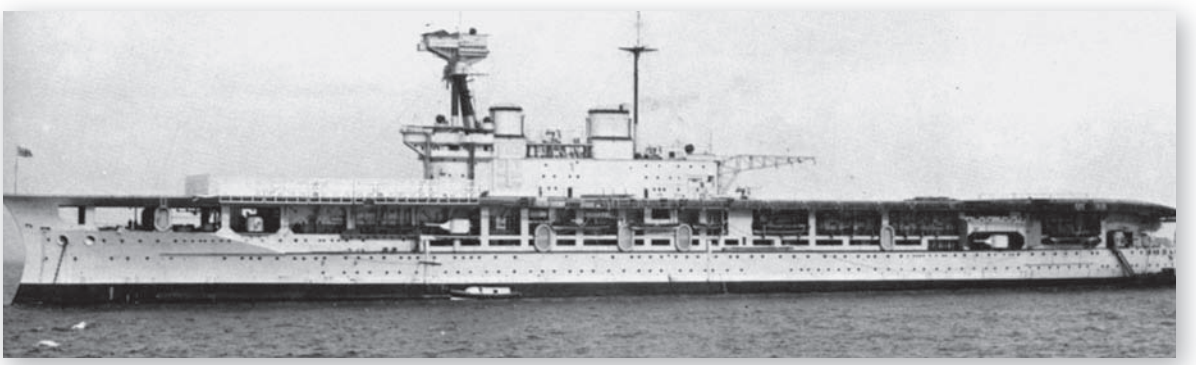
HMS *Courageous*

Courageous was serving with the Home Fleet when the war began, and was deployed on anti-submarine patrols in the South-Western Approaches to the English Channel. On 17 September 1939 she was struck by three torpedoes fired by U-20. She sank quickly, with the loss of 518 crew.

HMS *Glorious*

Glorious began the war with the Mediterranean Fleet, but spent the rest of the year in the Indian Ocean hunting for German raiders. In January 1940 she underwent a refit in Malta, then joined the Home Fleet in April, in response to the German invasion of Norway. She conducted air operations in support of Allied ground forces, and in June began covering the evacuation by ferrying aircraft from Norway to Britain. On 8 June she was intercepted off the Lofoten

This broadside view of the small pre-war aircraft carrier HMS *Eagle* illustrates her unusual hull shape, betraying her origins as a dreadnought battleship of an earlier era. *Eagle* was last modified in the mid-1930s.



On 13 November 1941 HMS *Ark Royal* was torpedoed by a German U-boat as the carrier approached Gibraltar. Despite every effort to save her, *Ark Royal* continued to flood, and she eventually sank early the following day. Only one crew member was lost.

Islands by the German battlecruisers *Scharnhorst* and *Gneisenau* while her flight deck was full of RAF fighters. *Glorious* and her two attendant destroyers were sunk by gunfire after a one-sided engagement lasting just over two hours. Most of the 1,250 crew were lost, along with more than 250 embarked RAF personnel.

HMS *Ark Royal*

Ark Royal began the war with the Home Fleet, and on 26 September one of her Blackburn Skuas scored the first Fleet Air Arm 'kill' of the war. She spent the rest of the year pursuing German raiders in the south Atlantic, including the pocket battleship *Graf Spee*. In March 1940 she was transferred to the Mediterranean, but returned to home waters following the German invasion of Norway in April. She operated in support of the Allied expedition and covered the latter's withdrawal. By July *Ark Royal* was back in the Mediterranean as part of Force H, based in Gibraltar. She participated in Operation *Catapult* (the attack on the Vichy French fleet at Mers-el-Kébir and Oran), and continued to support Force H operations in the western Mediterranean and eastern Atlantic. She joined the pursuit of the *Bismarck* in May 1941, and launched an air attack against the German battleship on 26 May. A torpedo damaged the enemy's rudder, slowing *Bismarck* sufficiently for the Home Fleet to catch and sink it. *Ark Royal* returned to Gibraltar, and spent the next few months operating in support of Malta convoys. On 13 November 1941 she was hit by a torpedo fired by U-81 off Gibraltar, and took on a severe list. Despite attempts to save her the carrier capsized and sank early the following morning, with the loss of one of her crew.

HMS *Illustrious*

Illustrious joined the Mediterranean Fleet in August 1940, and launched several strikes against Italian airfields and harbours in North Africa and the Aegean. On 10–11 November her aircraft carried out Operation *Judgement*, (a spectacular airstrike on the Italian naval base at Taranto), which succeeded in sinking one Italian battleship and crippling two more, all for the loss of two aircraft. On 10 January 1941 *Illustrious* was attacked by German dive-bombers west of Malta, and badly damaged. She sailed to Malta for emergency repairs, being bombed again there, then was sent to Alexandria and then Norfolk, Virginia. She rejoined the fleet in home waters in March 1942, then was dispatched to the Indian Ocean. In May she took part in Operation *Ironclad* (the invasion of Vichy-held Madagascar), before joining the Eastern Fleet. She returned to Britain for a refit in February 1943, and remained in home waters until September, when she sailed for the Mediterranean. She operated in support of Operation *Avalanche* (the Allied landings at Salerno), then returned to Britain for modifications before being sent to rejoin the

Eastern Fleet. From January 1944 she operated in the Indian Ocean, attacking Japanese bases in Burma and the East Indies. These raids continued into 1945, but in February she was designated part of the British Pacific Fleet and sent north to support the US landings on Okinawa. On 6 April she sustained minor damage during a *kamikaze* attack, and the following month headed home for a refit. She ended the war in Rosyth.

The flight deck of HMS *Illustrious* on 10 January 1941, pictured soon after the vessel was hit by eight bombs during a German dive-bomber attack off Crete. The hole marks where a 500kg bomb penetrated the armoured flight deck to explode in the hangar.

HMS *Formidable*

Formidable entered service in October 1940, and was sent into the Atlantic in pursuit of *Admiral Scheer*. In January 1941 she arrived in the Mediterranean to replace the damaged *Illustrious*, and on 28 March took part in the Battle of Cape Matapan, during which her aircraft launched successful strikes against the Italian fleet. On 26 May she was hit by two bombs while operating off Crete, and was sent for repair in Norfolk, Virginia. She returned to service in January 1942, joining the Eastern Fleet two months later. In May *Formidable* took part in Operation *Ironclad*, then remained in the Indian Ocean until October, when she was ordered to Gibraltar. She took part in Operation *Torch*, and remained in the Western Mediterranean until July, when she participated in Operation *Husky* (the Allied invasion of Sicily). She also supported Operation *Avalanche* in September. *Formidable* was recalled to home waters in October, and remained with the Home Fleet for a year, during which she served with the Arctic convoys, and took part in Operation *Goodwood* (air attacks on *Tirpitz*). *Formidable* joined the British Pacific Fleet in March 1945 and supported the US landing on Okinawa. She was hit but not disabled by a Japanese *kamikaze* attack on 4 May, and by July was launching air attacks on the Japanese mainland – strikes which continued until the Japanese surrender.

HMS *Victorious* pictured in late 1942, shortly before undergoing a major refit in Norfolk, Virginia. Six Fairey Albacore torpedo-bombers are ranged on the deck, ready for take-off. The Albacore needed a longer take-off run than the Swordfish.

This picture shows the immediate aftermath of an attack by Japanese *kamikaze* aircraft on HMS *Victorious* in May 1945. She was struck by three *kamikaze* while supporting the landings on Okinawa, but thanks to the armoured flight deck the damage was relatively minor.

HMS *Victorious*

Victorious joined the Home Fleet in April 1941, and her first mission was the pursuit of *Bismarck*. Her aircraft launched strikes against the German battleship, but failed to damage the latter. *Victorious* spent the next 16 months in northern waters, supporting Arctic convoys, transporting aircraft to Murmansk, and launching strikes against German targets in Norway. In August 1942 she was sent to the Mediterranean, where she took part in Operation *Pedestal*. After a brief refit she rejoined Force H, and participated in Operation *Torch* in November, before being sent to Norfolk, Virginia, on the first leg of a voyage to the Pacific. She arrived in Pearl Harbor in March 1943, and in August supported US landings on New Georgia. *Victorious* returned home in October, and remained with the Home Fleet until June 1944. During this period she took part in Operation *Tungsten* (an air attack on *Tirpitz*) in April, and attacked other German targets in Norwegian waters. She joined the Eastern Fleet in July 1944, and was used to strike at Japanese targets in Burma and the East Indies before joining the British Pacific Fleet in February 1945. She was hit by three *kamikaze* aircraft off Okinawa in May 1945, necessitating repairs in Australia. She rejoined the fleet in early August, and launched strikes against the Japanese mainland before the final Japanese surrender a week later.

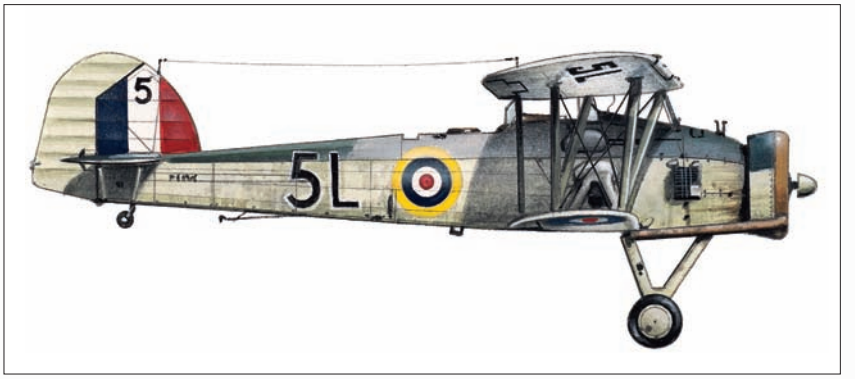
HMS *Indomitable*

Indomitable ran aground during a working-up cruise to the West Indies, necessitating repairs in Norfolk, Virginia. This prevented her from joining the

HMS *GLORIOUS*, 1940, AND HMS *ARK ROYAL*, 1941 (INSET: FAIREY SWORDFISH)

In 1939 HMS *Glorious* (top) served as part of the Home Fleet, and in the spring of 1940 she flew sorties in support of Allied landings in Norway. She was still in Norwegian waters in June, when she was caught and sunk by two German battlecruisers. Unlike HMS *Furious*, the two Courageous Class carriers (*Courageous* and *Glorious*) actually entered service as battlecruisers, but were converted in 1923. Both vessels were modified slightly during the interwar years, with the flight deck of *Glorious* was extended slightly so it overhung the vessel's stern. The ships each carried a respectable complement of 48 aircraft, and by 1939 both were considered useful members of the Home Fleet. This view shows *Glorious* as she looked during the Norway campaign.

HMS *Ark Royal* (bottom) represented the first of a new generation of British fleet carriers. Like the light carrier *Hermes* before it, *Ark Royal* was designed as a carrier and looked the part. Consequently she was more commodious than her converted predecessors, with hangar space for 60 aircraft. She entered service just a year before the outbreak of war, and acquired a formidable reputation. She operated off Norway in early 1940, and in May 1941 Swordfish torpedo-bombers from *Ark Royal* delivered the crucial rudder hit on *Bismarck* that allowed the Home Fleet to catch their German adversary. *Ark Royal* served as part of Force H based in Gibraltar, and played an active part in the naval battle for the Mediterranean until she was torpedoed and sunk by U-81 on 13 November, within sight of base. During operations in 1941 she appears to have been painted in an overall mid-grey.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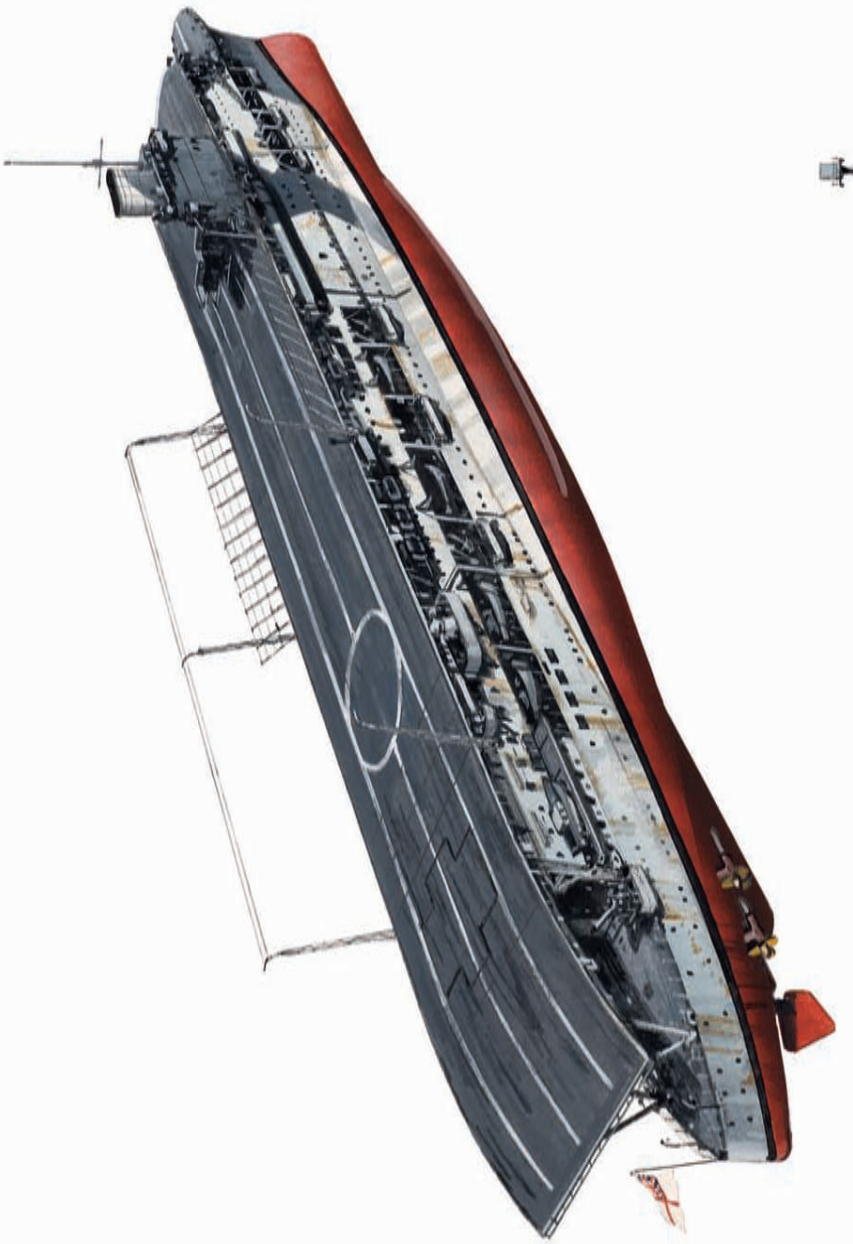
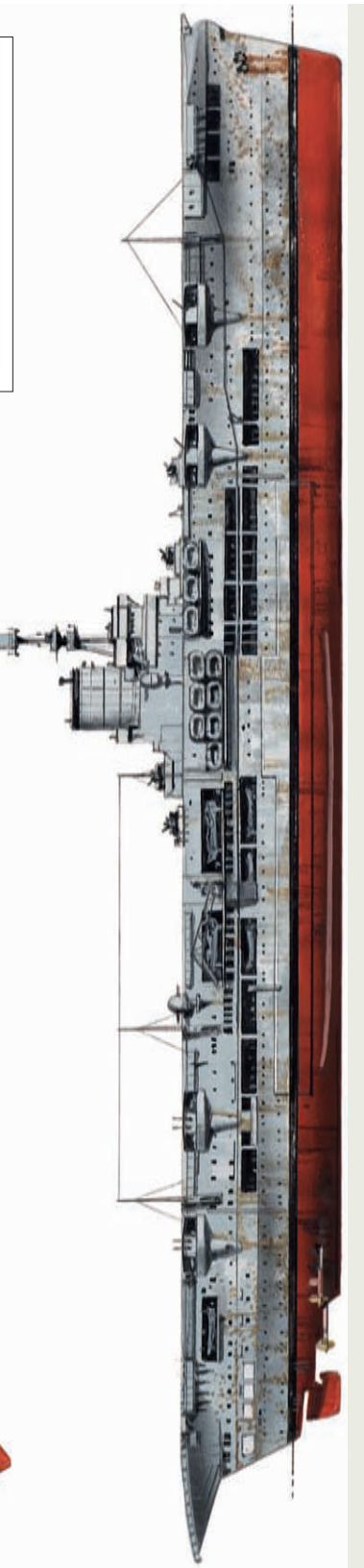




The fleet carrier HMS *Implacable*, pictured in Sydney Harbour soon after the end of the war. She saw service with the British Pacific Fleet during the closing months of the war against Japan, and remained in service until late 1955.

Eastern Fleet until December 1941 – the carrier arrived too late to share the fate of Force Z (the battlecruiser *Repulse* and the battleship *Prince of Wales*), which were sunk by Japanese aircraft off Malaya. *Indomitable* remained in the Indian Ocean until July 1942. In April she failed to intercept the Japanese carriers when they launched the sortie into the Indian Ocean that led to the loss of *Hermes*. Sent to Gibraltar, she took part in Operation *Pedestal* but was hit by two bombs. She returned to Norfolk for repairs, but by April 1943 was back in home waters. That June she rejoined Force H, and then took part in Operation *Husky*. On 16 July she was torpedoed by enemy aircraft, and returned to Norfolk for a third time in three years. After these repairs were completed she joined the Eastern Fleet, arriving in the Indian Ocean in July 1944. She operated against Japanese targets in the East Indies until February 1945, when she became part of the British Pacific Fleet. That April she was damaged by a *kamikaze* attack off Okinawa, and a month later was hit twice more while conducting air operations north of the Philippines. She remained operational, but after colliding with a British destroyer she was sent to Sydney for repairs, and ended the war in Australia.

HMS *Implacable*

Implacable entered service with the Home Fleet in June 1944, and flew strikes against German shipping and bases in Norway until March 1945, when she was sent to the Pacific. She joined the British Pacific Fleet in April, and two months later launched airstrikes against the Japanese base at Truk. By July she was serving alongside the US Third Fleet, launching attacks against Japanese shipping and bases in Japanese home waters. She was preparing for Operation *Olympic* (part of the projected Allied invasion of Japan), when the war ended.

Aircrew and deck personnel from HMS *Indefatigable*, photographed in late 1944, while the carrier was serving with the Home Fleet in Arctic waters. This Jeep was one of several vehicles used in moving aircraft and stores around the flight deck.

HMS *Indefatigable*

Indefatigable joined the Home Fleet in June 1944, and like *Implacable* was employed attacking targets and bases in Norwegian waters, then sailed in support of Arctic convoys. In August she participated in Operation *Goodwood*, but these attacks failed to damage *Tirpitz*. The carrier was then sent to join the British Pacific Fleet, and in January attacked Japanese targets in the East Indies.

By March she was off Okinawa, where she was hit by a *kamikaze* aircraft but suffered only minor damage. After a refit in Sydney she rejoined the fleet in July, and launched airstrikes against targets on the Japanese mainland until the end of the war in mid-August.

HMS *Unicorn*

Unicorn was earmarked as an aircraft maintenance carrier, but after joining the Home Fleet in June 1943 took part in a diversionary operation off Norway and conducted anti-submarine patrols in the Western Approaches. In

August she was sent to the Mediterranean, where in September she participated in Operation *Avalanche*. She returned to Scapa Flow in October, but two months later was ordered to the Far East. She joined the Eastern Fleet in January 1944, where she was used both as a support vessel and as a light fleet carrier. In February 1945 she joined the British Pacific Fleet, and in April operated in support of the US landings on Okinawa. The following month she was sent to Manus in the Admiralty Islands, where she resumed her support role until the end of the war in the Pacific.

Fleet Air Arm officers in the wardroom of an aircraft carrier, pictured while entertaining visitors from the Royal Air Force in customary naval style. Then as now, Fleet Air Arm officers had a boisterous, hard-playing reputation – a reflection of their dangerous occupation.

Colossus Class

Colossus and her sister ships *Glory*, *Venerable* and *Vengeance* were all sent to the Far East to join the British Pacific Fleet, but arrived too late to see active service. That said, *Venerable* did attack Japanese shipping two weeks after the end of hostilities in an effort to enforce the surrender. HMS *Pioneer* was commissioned in February 1945, but as a maintenance support ship saw no active service. Similarly, HMS *Ocean* entered service too late to play any active role in the war, but did enter the history books in December 1945 when she was used for the first carrier landing by a jet aircraft, a de Havilland Sea Vampire. Two months earlier the last official carrier launch of a Swordfish had taken place on the same flight deck, which demonstrates just how far British naval aviation had come during the Second World War.

CARRIER SPECIFICATIONS

HMS *Furious*

Fleet carrier

Displacement: 22,450 tons (standard)
Specifications: Length: 786ft 3in (overall)
Beam: 88ft
Draught: 24ft
Propulsion: Four Brown-Curtis turbines, 18 Yarrow boilers, producing 90,000shp
Maximum speed: 29½kt
Fuel capacity: 3,400 tons
Armour: Belt, 3in
Armament: Six twin 4in dual-purpose guns, three eight-barrelled 2pdr pom-poms
Aircraft capacity: 36 aircraft
Complement: 1,218 men

The carriers of the British Mediterranean Fleet under way during Operation *Pedestal* – HMS *Indomitable* in the distance, HMS *Victorious* in the centre, and HMS *Eagle* closest to the camera. Together these ships provided the Malta convoys with vital and effective air cover.

	Built	Laid down	Launched	Commissioned	Rebuilt as carrier	Fate
Furious	Armstrong-Whitworth, Tyneside	8 June 1915	15 August 1916	27 June 1917	1922–25 (Devonport)	Broken up 1948

HMS *Argus*

Light fleet carrier
Displacement: 14,550 tons (standard)
Specifications: Length: 566ft (overall)
Beam: 75ft 9in
Draught: 21ft
Propulsion: Four Parsons turbines, 12 boilers, producing 20,000shp
Maximum speed: 30kt
Fuel capacity: 2,000 tons
Armour: Belt, none
Armament: None
Aircraft capacity: 20 aircraft
Complement: 401 men

	Built	Laid down	Launched	Commissioned	Fate
Argus	Beardmore, Clydebank	June 1914	2 December 1917	September 1918	Broken up 1946

HMS *Eagle*

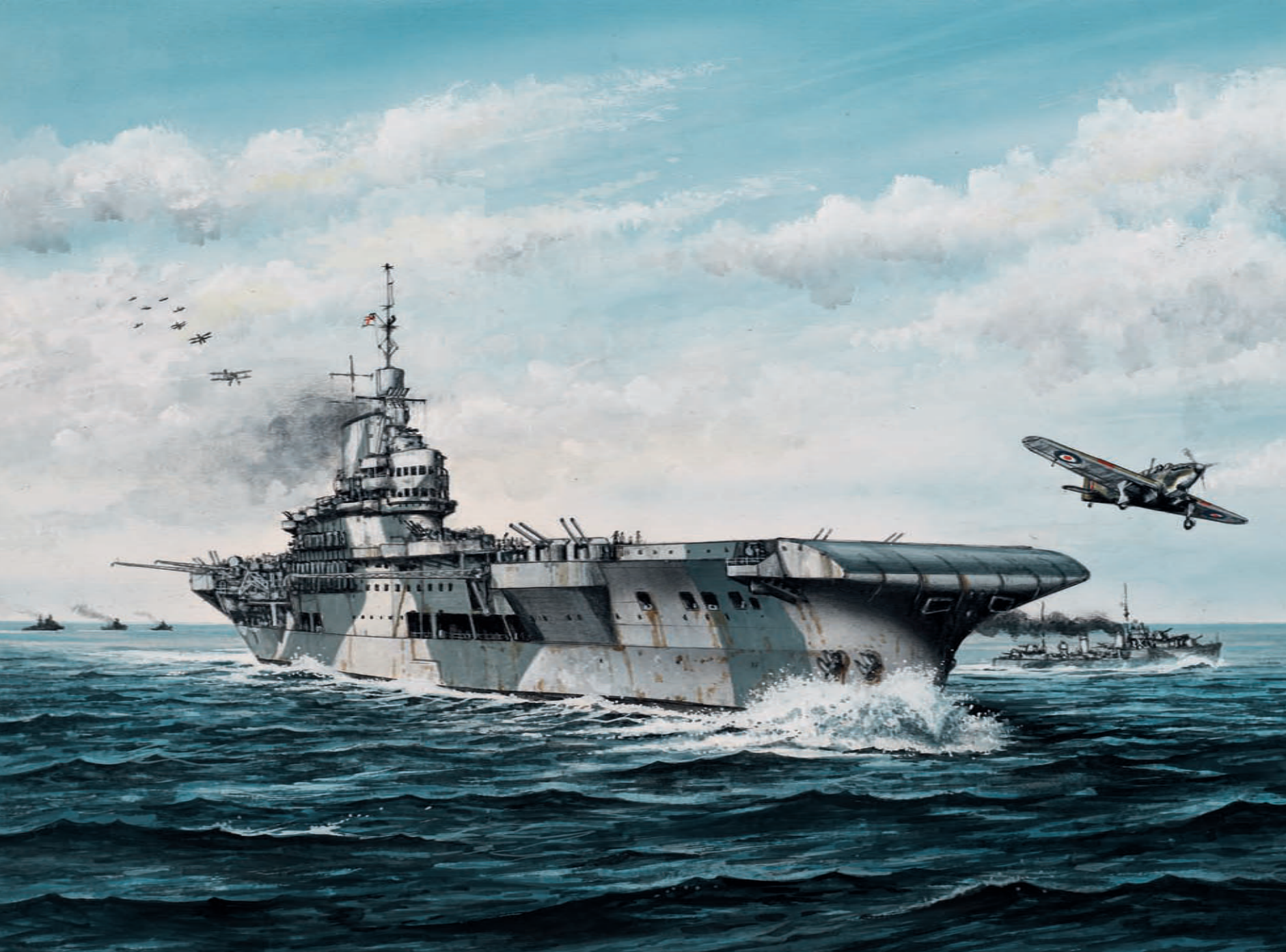
Light fleet carrier
Displacement: 21,630 tons (standard)
Specifications: Length: 667ft 6in (overall)
Beam: 94ft
Draught: 24ft 8in
Propulsion: Four Brown-Curtis turbines, 32 Yarrow boilers, producing 50,000shp
Maximum speed: 22½kt
Fuel capacity: 1,750 tons
Armour: Belt, 1–4.5in, flight deck, 1–1.5in

HMS *FORMIDABLE* AT THE BATTLE OF CAPE MATAPAN, 1941

In March 1941 the British Mediterranean Fleet was busy escorting transport convoys to Greece when intelligence reports reached Alexandria suggesting that the Italians had launched a large naval sortie into the eastern Mediterranean. On the evening of 27 March Adm Sir Andrew Cunningham put to sea with a force comprising three battleships, ten destroyers, and the new Illustrious Class carrier HMS *Formidable*. He planned to intercept the enemy at dawn somewhere off Cape Matapan – the southernmost tip of the Greek mainland.

First contact was made at 7.45am on 28 March by a detached force of four British light cruisers and four destroyers, which ran southwards, leading the pursuing Italians towards Cunningham's battleships. The Italians were overhauling the cruisers, so Cunningham ordered *Formidable* to launch an airstrike to ease the pressure. The aircrews chose the battleship *Vittorio Veneto* as their target, and although she was not hit, the Italians turned away. The battle then became a pursuit, where airpower held the key to victory. At around 1.45pm a second strike of three Albacores and two Swordfish was launched, escorted by two Fulmars. When contact was regained with the Italians at 3.20pm this small force launched its attack. A torpedo hit the stern of the Italian battleship, damaging her engines and slowing her down. The attackers lost one aircraft. Although the battleship subsequently escaped, the Italians lost three heavy cruisers in the surface action which followed, achieved with the help of that single torpedo.

The illustration depicts HMS *Formidable* sailing into the wind so as to launch the key second strike, with the fighters and two Swordfish torpedo-bombers already airborne and the remaining three aircraft lined up for take-off.



Armament: 12 single 6in guns, three single 4in guns, four single 3-pdr AA guns, two single 2pdr pom-poms, two eight-barrelled 2pdr pom-poms
Aircraft capacity: 21 aircraft
Complement: 950 men

	Built	Laid down	Launched	Commissioned	Fate
Eagle	Armstrong, Tyneside	20 February 1913 (as *Almirante Cochrane*)	8 June 1918	April 1920	Sunk 11 August 1942

HMS *Hermes*

Light fleet carrier
Displacement: 10,850 tons (standard)
Specifications: Length: 598ft (overall)
Beam: 70ft 3in
Draught: 18ft 6in
Propulsion: Two Parsons turbines, six Yarrow boilers, producing 40,000shp
Maximum speed: 25kt
Fuel capacity: 2,000 tons
Armour: Belt, 3in, flight deck, 1in
Armament: Six single 5.5in guns, four single 4in guns, two four-barrelled machine-guns
Aircraft capacity: 20 aircraft
Complement: 664 men

	Built	Laid down	Launched	Commissioned	Fate
Hermes	Armstrong, Tyneside	15 January 1918	11 September 1919	February 1924	Sunk 9 April 1942

Courageous Class

Fleet carriers
Displacement: 22,500 tons (standard)
Specifications: Length: 786ft 7in (overall)
Beam: 90ft 6in
Draught: 27ft 11in
Propulsion: Four Brown-Curtis turbines, 18 Yarrow boilers, producing 90,000shp
Maximum speed: 30kt
Fuel capacity: 3,685 tons (*Glorious* 3,450 tons)
Armour: Belt, 3in
Armament: 16 single 4.7in guns, four single 2pdr pom-poms
Aircraft capacity: 48 aircraft
Complement: 1,216 men

	Built	Laid down	Launched	Commissioned	Rebuilt as carrier	Fate
Courageous	Armstrong, Tyneside	28 March 1915	5 February 1916	1 January 1917	1924–28 (Devonport)	Sunk 17 September 1939
Glorious	Harland & Wolff, Belfast	1 May 1915	20 April 1916	1 January 1917	1924–30 (Devonport)	Sunk 17 June 1940

HMS *Ark Royal*

Fleet carrier
Displacement: 22,000 tons (standard)
Specifications: Length: 800ft (overall)
Beam: 94ft 9in
Draught: 27ft 9in
Propulsion: Three Parsons turbines, six Admiralty boilers, producing 102,000shp
Maximum speed: 31kt
Fuel capacity: 4,620 tons
Armour: Belt, 4.5in
Armament: Eight twin 4.5in dual-purpose guns, four eight-barrelled 2pdr pom-poms
Aircraft capacity: 60 aircraft
Complement: 1,580 men

British sailors pictured on their messdeck on board a British aircraft carrier, avidly reading *Pacific Post* – the newspaper of the British Pacific Fleet. Most non-specialist sailors on board these carriers were in their late teens or early twenties.

	Built	Laid down	Launched	Commissioned	Fate
Ark Royal	Cammell-Laird, Clydebank	16 September 1935	13 April 1937	16 November 1938	Sunk 14 November 1941

Illustrious Class

Fleet carriers
Displacement: 23,000 tons (standard)
Specifications: Length: 753ft 3in (overall)
Beam: 95ft 9in
Draught: 28ft 6in
Propulsion: Three Parsons turbines, six Admiralty boilers, producing 111,000shp
Maximum speed: 30½kt
Fuel capacity: 4,840 tons
Armour: Flight deck: 3in, belt and hangar sides: 4.5in
Armament: Eight twin 4.5in dual-purpose guns, six eight-barrelled 2pdr |pom-poms
Aircraft capacity: 36 aircraft
Complement: 1,229 men

	Built	Laid down	Launched	Commissioned	Fate
Illustrious	Vickers-Armstrong, Barrow-in-Furness	27 April 1937	5 April 1939	25 May 1940	Broken up 1956
Victorious	Vickers-Armstrong, Tyneside	4 May 1937	14 September 1939	15 May 1941	Broken up 1969
Formidable	Harland & Wolff, Belfast	17 June 1937	17 August 1939	24 November 1940	Broken up 1953

HMS *Indomitable*

Fleet carrier
Displacement: 23,000 tons (standard)
Specifications: Length: 753ft 11in (overall)
Beam: 95ft 9in
Draught: 29ft

Propulsion: Three Parsons turbines, six Admiralty boilers, producing 111,000shp
Maximum speed: 30½kt
Fuel capacity: 4,500 tons
Armour: Flight deck, 3in; belt, 4.5in; hangar sides, 1.5in
Armament: Eight twin 4.5in dual-purpose guns, six eight-barrelled 2pdr pom-poms
Aircraft capacity: 45 aircraft
Complement: 1,392 men

	Built	Laid down	Launched	Commissioned	Fate
Indomitable	Vickers-Armstrong, Barrow-in-Furness	10 November 1937	26 March 1940	10 October 1941	Broken up 1955

Implacable Class

Fleet Carriers
Displacement: 23,450 tons (standard)
Specifications: Length: 766ft 4in (overall)
Beam: 95ft 9in
Draught: 28ft 11in
Propulsion: Four Parsons turbines, eight Admiralty boilers, producing 148,000shp
Maximum speed: 32kt
Fuel capacity: 4,690 tons (*Indefatigable* 4,810 tons)
Armour: Flight deck, 3in; belt, 4.5in; hangar sides, 2in
Armament: Eight twin 4.5in dual-purpose guns, five eight-barrelled 2pdr pom-poms, one four-barrelled 2pdr pom-pom
Aircraft capacity: 60 aircraft
Complement: 1,585 men

	Built	Laid down	Launched	Commissioned	Fate
Implacable	Fairfield, Clydebank	21 February 1939	10 December 1942	28 August 1944	Broken up 1955
Indefatigable	John Brown, Clydebank	3 November 1939	8 December 1942	3 May 1944	Broken up 1956

HMS *VICTORIOUS*, 1943, AND HMS *INDEFATIGABLE*, 1944

The first of the four fleet carriers of the Illustrious Class began to enter service in 1940. These vessels were similar in appearance to HMS *Ark Royal*, but they had one rather than two hangar decks, and were better armoured. HMS *Victorious* (top) entered service in 1941, and within days she was involved in the pursuit of the *Bismarck*. One of her Swordfish torpedo-bombers damaged the German battleship. *Victorious* later provided air cover for Arctic convoys, then took part in the Malta convoys before being sent to the Pacific to operate with the US Navy. This shows her as she looked during this spell in the Pacific, having been repainted an overall blue, with a disruptive pattern covering the flight deck.

HMS *Indefatigable* (bottom) and her sister ship HMS *Implacable* were modified versions of the Illustrious Class, with armour around the hangar removed in order to accommodate more aircraft. These carriers were capable of operating 54 aircraft apiece, compared with the 36 aircraft on the earlier class of fleet carriers. In August 1944 *Indefatigable* took part in an airstrike on the battleship *Tirpitz* in the Altenfjørd, Norway. This damaged the target, which was subsequently finished off by heavy bombers. *Indefatigable* then joined the Eastern Fleet in the Pacific, spending the rest of the war fighting the Japanese. This view shows the carrier as she looked during operations with the Home Fleet.

Flight-deck crews on board HMS *Victorious* are pictured arming Fairey Barracuda dive-bombers and Vought Corsair fighters in readiness for a strike against *Tirpitz*, part of Operation *Tungsten*, launched on 3 April 1944. The German battleship was damaged but not sunk.

HMS *Unicorn*

Light fleet carrier
Displacement: 14,750 tons (standard)
Specifications: Length: 646ft (overall)
Beam: 90ft
Draught: 24ft
Propulsion: Two Parsons turbines, four Admiralty boilers, producing 40,000shp
Maximum speed: 24kt
Fuel capacity: 7,500 tons
Armour: Belt, 1.5–4.5in
Armament: Four twin 4in dual-purpose guns, four eight-barrelled 2pdr pom-poms
Aircraft capacity: 35 aircraft
Complement: 1,200 men

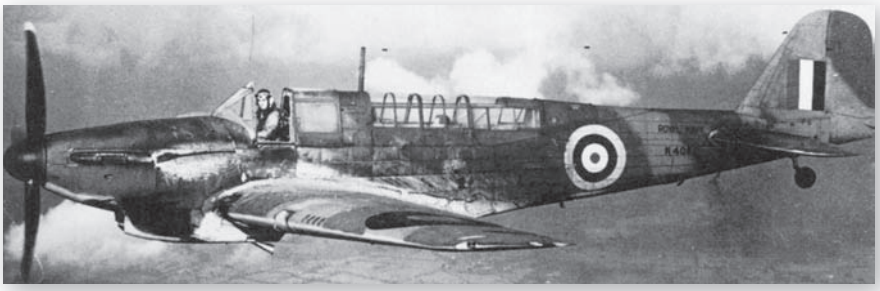
	Built	Laid down	Launched	Commissioned	Fate
Unicorn	Harland & Wolff, Belfast	29 June 1939	20 November 1941	12 March 1943	Broken up 1959

Colossus Class

Light Fleet Carrier
Displacement: 13,190 tons (standard)
Specifications: Length: 693ft (overall)
Beam: 80ft
Draught: 23ft 3in
Propulsion: Parsons turbines, 4 Admiralty boilers, producing 40,000shp
Maximum Speed: 25kt
Fuel Capacity: 3,196 tons
Armour: None
Armament: 6 four-barrelled 2pdr pom-poms
Aircraft Capacity: 37 aircraft
Complement: 1,300 men

	Built	Laid down	Launched	Commissioned	Fate
Colossus	Vickers-Armstrong, Tyneside	1 June 1942	30 September 1943	16 December 1944	Transferred to French service, 1946
Glory	Harland & Wolff, Belfast	27 August 1942	27 November 1943	2 April 1945	Broken up 1961
Ocean	Stephen & Sons, Clydebank	8 November 1942	8 July 1943	8 August 1945	Broken up 1953
Venerable	Cammell-Laird, Clydebank	3 December 1942	30 December 1943	17 January 1945	Transferred to Dutch service, 1948
Vengeance	Swan Hunter, Clydebank	16 November 1942	23 February 1944	15 January 1945	Transferred to Brazilian service, 1956
Pioneer	Vickers-Armstrong, Barrow-in-Furness	2 December 1942	20 May 1945	8 February 1945	

Note: The Colossus Class light fleet carriers *Perseus*, *Theseus*, *Triumph* and *Warrior* were all commissioned after the end of the Second World War.



The Fairey Fulmar, essentially a naval variant of the Fairey Battle light bomber, was used as both a fighter and a dive-bomber. It proved as sluggish as the Battle, but remained in Fleet Air Arm service from mid-1940 until late 1942.

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BELOW LEFT
Aircraft controllers formed a vital link between aircrews and the carrier, and were able to direct the aircraft to their target with a fair degree of efficiency. These young officers are all members of the Royal Naval Volunteer Reserve.

BELOW RIGHT
The Barracuda entered service in early 1943, as a replacement for the Swordfish and the Albacore. It was a dual-purpose torpedo- and dive-bomber, but while it was reasonably effective, its crews regarded it as dangerous and difficult to fly.

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